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EDUCATIONAL EXHIBITS AT AGRICULTURAL SHOWS.

The Agricultural Show affords an excellent opportunity for educational exhibits and in recent years in Ceylon increasing attention has been given to the provision of adequate exhibits of educational value.

The Anchylostomiasis campaign has in the past been frequently represented by extensive exhibits at shows, the Educational Department has been similarly represented by exhibits of weaving, carpentry work, etc., and more recently the Agricultural Department has provided exhibition stalls, containing publications, examples of new products and collections of agricultural products being grown on the Experiment Stations.

At the Matale Show a small beginning was made in the direction of Departmental Exhibits at Agricultural Shows and the exhibit created a considerable amount of interest. Agricultural officers and instructors were present throughout the whole of the show and gave to enquirers full particulars in regard to the various exhibits.

At the Galle Show, a larger exhibit was made in a specially constructed shed. Here were exhibited specimens of sweet potato, manioc, paddy, sugar-cane and tobacco varieties, while special attention was given to exhibits of citrus fruits and particularly of limes and its products citrate of lime, concentrated juice and essential oil. Attention was also called to Co-operation.

The number of visitors to this exhibit was very considerable and agricultural officers and instructors were present at the exhibit throughout the exhibition. A large number of the leaflets issued by the Department were distributed.

Similarly small exhibits were made at the smaller agricultural shows in the Southern Province during the year and were visited freely by the village cultivators that were present at these shows.

The educational value of these exhibits is beyond dispute and the interest taken in them cannot be estimated too highly, and it is to be hoped that they may become regular features at the principal shows.

These shows afford opportunities of getting into close touch with a number of agriculturists and it affords an opportunity of illustrating to them some of the activities of the Agricultural Department and of the attempts being made to acquire further information regarding the existing crops of the Colony and of new products of possible economic value.

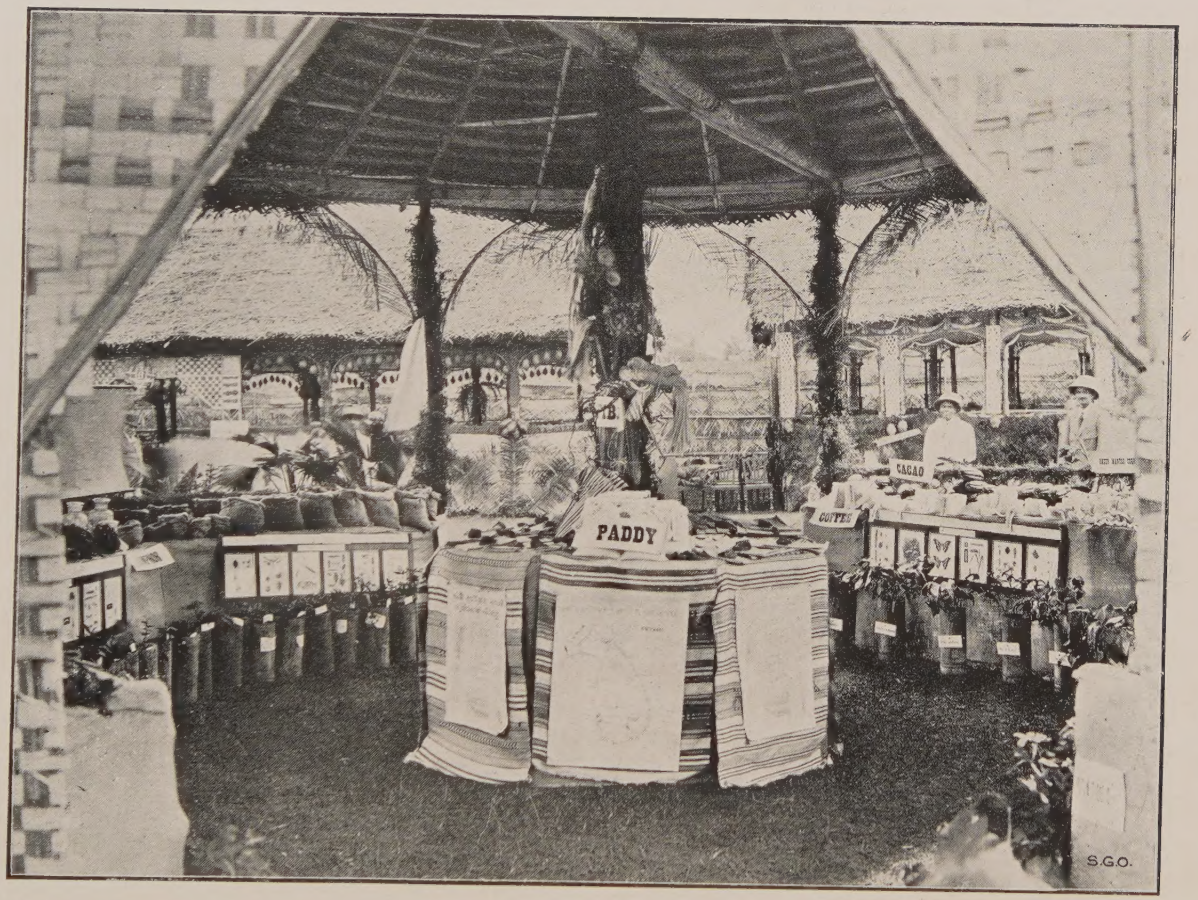
It is also possible that lectures on agricultural topics can be arranged to be given during the time of the show, and the agricultural exhibit utilized for illustration purposes.

The officers in charge of the exhibits are also enabled to ascertain by the enquiries made by visitors something of their requirements and thereby assist in bringing the work of the Department into the closest possible touch with those whom it is designed to serve.

The interest that has been taken in these Departmental exhibits at Agricultural Shows during the year has been gratifying, and an extension of the scheme could be made with advantage if finances permit.

In the present number of the TROPICAL AGRICULTURIST is given illustrations of the Department of Agriculture's exhibit at the Galle Show and from these readers will be afforded an opportunity of seeing the nature of the exhibit made.

INTERIOR OF DEPARTMENT OF AGRICULTURE EXHIBIT AT GALLE AGRICULTURAL SHOW.



INTERIOR OF DEPARTMENT OF AGRICULTURE EXHIBIT AT GALLE AGRICULTURAL SHOW.

TEA.

TRIALS OF NITROGENOUS MANURES ON TEA.

The plots for this trial were laid out and planted in 1916 with this particular experiment in view, and from the beginning everything possible has been done to make and keep them even.

In spite of this, it was soon clear that the initial fertility of the soil varied so greatly on different plots that one could only hope for an approximation to accuracy by averaging over a number of plots receiving the same treatment. Of the eighteen plots three, therefore, were used as check plots, while the remaining fifteen provided 5 sets of 3 plots each, and each of these 5 sets received a different manure.

At the end of 1918 the plants were collar-pruned, and grew so badly in 1919 that an average of only $1\frac{1}{4}$ maunds pucca tea per acre was obtained. As each plot contained only 54 bushes, the error in the plucking and weighing of the leaf obtained at each plucking exceeded the difference between the plots, and in that year therefore no figures were obtained which could be considered of any value for measuring the initial fertility of the plots.

The tea having been left unpruned, yields were better, so that the error of weighment could be disregarded, and the yields obtained in 1920 up to end of May are taken as indicating the initial fertility.

There were no vacancies, but there were a few infillings, and weak bushes, which were left unplucked from the beginning of the season. In calculating yield per acre these are allowed for.

The manures were applied at the end of May.

The manuring was as follows :—

	Manure per Acre			Nitrogen per acre lb.	Phosphoric acid per acre lb.
1.	Check Bone meal	162	lb.	5·6	35·6
2.	Nitrate of soda	212	,,	30·0	Nil
	Bone meal	162	,,	5·6	35·6
3.	Sulphate of ammonia	150	,,	30·0	Nil
	Bone meal	162	,,	5·6	35·6
4.	Mustard cake	704	,,	32·7	17·6
	Bone meal	82	,,	2·9	18 0
5.	Nitrox	320	,,	32·0	12·8
	Bone meal	104	,,	3·6	22·8
6.	Green jungle	3	tons	30·0 approx.	Nil
	Bone meal	162	lb.	5·6	35·6

The plots receiving nitrogenous manures thus each received exactly 30 lb. more nitrogen per acre than the check plot and the same quantity of

phosphoric acid, except in the case of the plot receiving the green jungle. This was originally sown with sunn hemp, and it was expected that here also the nitrogen added as green stuff would not differ greatly from 30 lb. Unfortunately the green crop failed completely owing to attack by a root disease (which fortunately does not attack tea). After seven weeks' growth the green crop was abandoned as hopeless, and the crop (averaging less than half a ton per acre) was made up to 3 tons per acre with green jungle, thatch, phutuka (*Melastoma*) and boga medeloa, this being cut from neighbouring waste land, wood being up to finger-thick.

This was very lightly hoed in on July 17th.

This last set (6) therefore must be considered as a trial of green jungle as manure. Its action differs from that of a green crop since there is no suffering of the tea while the crop is growing. In this case, of course, a crop was growing but it was so poor that the total growth on the green-manured plots hardly exceeded that of the jungle on the other plots, and it is considered that the loss in tea crop from the growth of the green manure was in this case practically negligible. With favourable (wet) weather, however, it was shown at Heeleaka that the bad effect of a green manure while growing is not very great, and the result from this, set 6, may therefore be considered to give some indication of the probable efficiency of a green crop.

The actual weights obtained are recorded below in order to show how uneven were the plots, and also to show that there was no great difference between the averages of any three evenly distributed plots. The weights look small, but the average plucking yielded about 2 lb. from a plot and as weighment was certainly accurate to half-an-ounce the possible error from weighment cannot exceed 1½%, and with 40 pluckings errors in weighment are probably negligible.

Actual weight of leaf in lb. and ozs. from 1/50 acre plot :—

		To end of May before manuring		June to Nov. after manuring	
1	Check plots	11·6 12·5 9·15	11·3	49·3 46·13 42·8	46·3
2	Nitrate of soda	9·7 11·11 11·14	10·13	49·7 53·9 47·4	50·1
3	Sulphate of ammonia	10·0 11·14 9·8	10·7	47·6 50·10 42·8	46·13
4	Oilcake	10·15 10·1 10·15	10·10	44·2 46·5 46·12	45·12
5	Nitrox	11·7 10·6 11·10	11·2	47·3 45·14 44·5	45·13
6	Green jungle	16·3 9·9 8·8	11·7	65·5 43·15 40·3	49·13

The difference in total crop look very small, but can be better judged when calculated to weigh per acre.

In the following table, allowance has been made for the bushes left unplucked :

LB. GREEN LEAF PER ACRE.

	To end of May, average before application of manure	June to November, average after application of manure	Increase over check plot lb.
1 Check plot ...	598	2,465	22
2 Nitrate of soda ...	579	2,689	224
3 Sulphate of ammonia ...	577	2,585	120
4 Oilcake ...	574	2,456	...
5 Nitrox ...	602	2,473	8
6 Green jungle ...	634	2,763	298

These increases cannot be considered as indicating the value of the manure, since the plots were not equal before the manure was applied.

The yield from the check plots from June to November is 4·12 times the yield from March to May. It is probably fairly accurate to assume that had no manures been applied the other plots would have increased at the same rate. By making this assumption we may calculate what the yield without manure would have been, and the difference between this calculated yield and the actual yield probably gives the best index to the efficiency of the various manures, obtainable from these experiments.

	Yield to end of May	Actual yield June-Nov.	Calculated yield if no manure had been applied	Increase per acre in lb. green leaf	Approximate cost per acre of increase
Nitrate of Soda -	579	2,689	2,390	299	Rs. 27·0
Sulphate of ammonia	577	2,585	2,377	208	,, 27·0
Oilcake -	574	2,456	2,365	91	,, 20·8
Nitrox -	602	2,473	2,480	—	,, 17·8
Green jungle -	634	2,763	2,612	151	Labour only

From this we can calculate the increase per cent. due to the manures. While no pretence to exactitude is made it is believed that these figures do give a fair idea of the relative efficiency for tea of the various manures in the year of application.

Nitrate of soda	...	...	12½ %
Sulphate of ammonia	...	...	8½ %
Green jungle	...	...	6 %
Oilcake	...	...	4 %
Nitrox	...	...	0 %

The smallness of the effect of the manuring may be a matter of surprise, particularly as this tea at the time of application showed every indication of requiring manure. In 1919, plucking at 27 inches after collar-pruning, the yield from the check plots was only 1¼ mds. pucca tea per acre, and the appearance of the plots up to the end of May 1920 was extremely miserable, Brown blight being bad. From June onwards very great improvement set in and 9½ maunds was obtained from the check plots in 1920 (unpruned). The

disparity is much greater than can be explained even by the very great difference in the two seasons. In 1919, 10 maunds slaked lime per acre had been applied. It is probable that the effect of this in the year of application was to reduce crop, while in 1920, the effect was favourable. Even so, this soil is markedly deficient in phosphoric acid and it is probable that all plots including the check plot benefited from the application of bone meal.

The combined effect of the lime and bone meal possibly allowed more rapid production of nitrates from the soil organic matter, so that the effect of added nitrogen was less marked than usual.

However, it is believed that the effect of such small doses of manure as are generally used in tea is not normally much greater than that obtained in this experiment. If so, it is clear, that manuring generally is not a paying proposition in the present state of the tea market, except in the case of such manures as cost little or nothing beyond the cost of labour for which, at times, there may be no other use. Such manures are green jungle, Bheel soil, and to a greater extent Cattle manure and Green crops.

Such manuring is strongly recommended even in view of restricted crops. Finer plucking alone will, in many cases, do all the restricting necessary. In extreme cases where the plucking system is changed to taking strictly 2 leaves and a bud, instead of an average 3 leaves and a bud or more, the restriction would probably be nearer 50% than 20% unless the number of rounds of plucking could be increased effectively.

Nor need the smallness of the results from this experiment be discouraging. If there is any residual effect from manuring on the yielding capacity of the bush (and that can hardly be doubted), then continuous manuring will increase yielding capacity in a compound ratio. An increased efficiency of 5% per annum would double the yield in 15 years.

The characteristics of each manure are commented on separately below, and the rapidity with which each comes into action is traced from curves obtained by plotting the total yields per acre obtained in each period of four weeks against time in weeks. It will be seen that the application of manures coincided with the beginning of a very sudden increase in the rate of leaf production. This sudden rush of leaf was due mainly to the very favourable weather of June, but the jump was much more marked than on unmanured plots and is possibly partly accounted for by the action of the bone meal which all plots, including the check plots, received.

Rapidly Available Manures.—A study of Fig 1* shows that both the nitrate of soda and sulphate of ammonia plots had averaged slightly lower yields than the check plots before the manure was applied.

During the four week period following application the sulphate of ammonia had shown no result and the nitrate of soda only a very small relative increase. In the second four-week period both manures gave a very marked increase in leaf and this was maintained in the third and fourth periods, although both, and particularly sulphate of ammonia, showed a falling off.

In the fifth period nitrate of soda fully maintained its advantage, but the falling off in effect of sulphate of ammonia was more marked. In the six and last period nitrate of soda still shows an increase, while the sulphate of ammonia plots gave even less than the check plots.

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* Not reproduced

If these experiments have any accuracy at all, this greater efficiency of nitrate of soda towards the end of the season is significant. The season was certainly much more favourable to the use of nitrate of soda than the average season in Assam, because the rainfall was small (67½ inches) and very well distributed. Hitherto, this department has been, with reason, very shy of advising the use of nitrate of soda in the tea districts. Until recently its price compared very unfavourably with that of other manures; and as it is known to be very readily washed out of the soil, it could not be recommended against other manures less liable to loss. Experiment in future years may show that this attitude is justified in many seasons.

But no consideration of favourable season can explain its greater lasting effect compared with sulphate of ammonia. As far as the nitrogen contents are concerned nitrogen as nitrate is known to be less lasting than nitrogen as ammonia. The lasting effect of the nitrate of soda must be attributed to some constitutent other than the nitrogen. Potash is known to increase the period of vegetative growth of a plant. This particular sample of nitrate of soda (the purest then available) was found by analysis to contain 5% potash, and thus the manure applied added 10 lb. of potash per acre to the soil. This added potash was probably reinforced by additional available potash liberated by the nitrate of soda from the soil minerals. The potash so supplied probably stimulated vegetative growth of this unpruned tea, at a time when it was inclined to go "banjhi."

However, it is possible that some adverse secondary effect of the sulphate of ammonia was coming into play, and the effects of these two manures in future years will be watched with interest.

Slow Acting Manures.—A study of the curves shown in Fig, 2* shows that the effects of the nitrox and of the oilcake were very similar. The two curves run practically parallel and are not widely separated for the whole of their lengths. Since, however, the oilcake curve starts somewhat below that of nitrox and in the last eight weights is very slightly above it, it may be concluded that the action of oilcake was slightly more favourable than that of nitrox.

Neglecting the first four weeks' pluckings both curves start definitely below that for the check plot, from July 23rd become practically the same curve, and only show a definite superiority on October 15th, twenty weeks after the manures were applied, and that superiority is very slight.

Nitrox is a mixture of sinews and hoofs and horns, crushed and torn into as fine a state of division as such material can reasonably be expected to attain. Similar are Nervox, Ligox, Musclox, and Sinox, though the last-named is generally supplied in unduly large pieces, and also contains biggish lumps of bone.

Such manures as these do not readily decompose, and must always be comparatively slow acting, but that they should show practically no result at all is certainly surprising. If such manures are to be of any use at all they must be used in larger quantities and must be applied as early as possible, February, or even January to allow time for decomposition.

Much more surprising is the hardly less marked failure of oil-cake. The particular sample used was purchased in the local bazaar, and was obviously

* Not reproduced

a good specimen of "country" oilcake. Its analysis was good—4·7% nitrogen—and no adulteration could be suspected. It, however, was much more oily than average samples, and on analysis was found to contain 15% of oil. This high percentage of oil is the probable reason for its low availability.

Previous experiments with oilcake have given very definite results in the year of application.

All these plots, after cutting across at 24 inches, will be plucked next year without further manuring, and sufficient yield is expected to determine residual effects of the manures. It is expected that both nitrox and oilcake will show up ; but if decomposition is very slow, it is possible that at no time will there be a sufficient increase in the concentration of nitrates in the soil to produce any definite increase in crop.

It is possible, however, that the comparative inefficiency of these manures does not lie wholly in the insoluble nature of their nitrogen compounds.

Both these manures contain phosphorus compounds, and in order that all plots might receive the same quantity of phosphorus, the quantities of bonemeal applied to these plots were less than were applied to all the other plots including the check plots. Now available phosphoric acid has a very great effect in this soil ; and it is possible that the failure of nitrox and oilcake may not be due only to the comparatively less available forms in which they contain their nitrogen, but largely to the inefficiency of their phosphorus compounds.

Both, however, are generally cheaper per unit of nitrogen than readily available manures, even if no allowance is made for their phosphorus ; and at the next application of manure their phosphorus contents will be ignored.

Green Jungle.—(See Fig. 3)* starting definitely above the check plot, the yield for the green jungle plots retains much the same relative position during the seven weeks following the application of bonemeal and growing of the green crop, indicating that the effect of the growth of the small green crop was slight.

Following the hoeing in of the 3 tons per acre of green stuff on July 17th, the rise in the yield is almost immediate. The effect of the green stuff was in fact more rapid even than that of nitrate of soda. The green stuff was of course applied at a season when the effect would be expected to be more rapid. Temperature and soil moisture were both very favourable.

The mechanical effect on the physical condition of the soil must also have been very great. *Green jungle* would of course be expected to prove more efficient than nitrate of soda, since it supplies not only nitrogen, in a form here shown to be very efficient, but also organic matter, and additional phosphoric acid, lime, and particularly potash. Applied as it was, the top few inches of soil rapidly became a much improved medium for the growth of beneficent soil organisms.

The calculated increase of 6% in the season is small only because the manure was applied so late in the season. Such manure has previously generally been used in trenches. The present experiment shows that green stuff may be used as a top dressing, and is likely to be very efficient as a manure for cut-back tea.—H.R.C.—SCIENTIFIC DEPT., QUARTERLY JOURNAL OF INDIAN TEA ASSN., PART 1, 1921.

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* Not reproduced.

RUBBER.

DEFECTS IN PREPARED RUBBER.

FAULTS ON THE ESTATE AND THEIR REMEDIES.

The following article written *specially to the* Malayan Tin and Rubber Journal by a well-known planter has been taken from that Journal Vol. X No. II. and reproduced for the benefit of the readers of the Tropical Agriculturist.

SHEET RUBBER.

The principal defects in sheet rubber, at least as adjudged by the Singapore market are :—

(1) Bubbles
(2) Rust
(3) Dirt (Specky, creosote drippings, etc.
(4) Undercured (i.e. incompletely dry.)
(5) Under or over smoked
(6) Moulds

(1) Bubbles. According to Eaton the presence of bubbles has no detrimental effect upon the quality of the rubber. In vulcanisation tests carried out by him he found that the samples containing bubbles were as good as the samples which were free from bubbles. Still as the market demands a freedom from such so-called defect it is up to the producer to satisfy that demand. The chief causes of bubbles are:—

(a) Not using sodium sulphite, using a poor quality of that compound, or an insufficient amount.

(b) Bad mixing of the sodium sulphite solution, both in itself and also with the latex.

(c) The mixing of semi-coagulated latex (brought in by slow or inexperienced tappers, brought in during wintering of the trees or from freshly opened cuts) with good latex in the bulking tanks.

(d) Incorrect use of the acid.

(e) An overheated factory.

(a) Every care should be taken to make sure that the sodium sulphite employed is of a high grade quality. This salt is an anti-coagulant and the whole object in employing it is to prevent partial natural coagulation occurring until one is ready for the latex to coagulate. A few estates still use a solution of formalin to prevent this natural coagulation taking place, but a solution of sodium sulphite is preferable. Sodium sulphite deteriorates when exposed to the air, sodium sulphate being formed. This salt has no anti-coagulant properties, and if allowed to remain in the rubber it is liable to cause the rubber to become damp and sticky through it taking up water from the air. The use of sodium sulphite of a poor quality thus does not prevent premature coagulation but is liable to spoil the rubber to which it is added.

(b) The sodium sulphite must be well mixed and completely dissolved in the water. For factory use 3 to 4 ounces should be dissolved in a gallon of water and put into the Shanghai jar into which the latex is to be sieved. That quantity is sufficient for about 50 gallons of standardised latex. Every now and again as the latex is being added the mixture of latex and sodium sulphite solution should be stirred.

(c) It will be the common experience of most planters that late tappers often bring their latex to the store in a semi-coagulated state. If this is added to the other latex in the tank, one runs a great risk of getting bubbles in the sheet. The sodium sulphite solution in the tank or jar is unable to undo the coagulation that has already occurred and this semi-coagulated latex, if added, will thus be well mixed with the other latex in the tank and bubbles may thus occur in every sheet made from the latex. During the wintering, and sometimes when new cuts are opened on the trees, a considerable amount of latex comes into the store semi-coagulated, and also full of naturally coagulated lump rubber. As it should be the endeavour of every planter at this time to produce the greatest proportion of his crop as possible as No. 1 sheet or crepe, the latex coming to the store in a semi-coagulated condition or full of lump rubber means a loss. To prevent this natural coagulation of the latex in the field, and thus to prevent a high percentage of lump rubber, sodium sulphite solution should be used in the field. It can either be used by giving each coolie about half a pint of solution in his collecting pail into which the latex is added, or he may be supplied with a pint in a bottle of which a little is poured down the upright channel on the tree or a few drops added to the cup when the tree is tapped. The solution of sodium sulphite can be made up as stated in (b). Every care should be taken to prevent waste of time between collection of the latex and coagulation. Coolies should not be allowed to take their latex to the lines and prepare their mid-day meal before bringing their latex to the store.

(d). The use of a too strong solution of acid, too much acid or an insufficiently diluted solution, which may cause a local coagulation of the latex and not a uniform coagulation of the whole volume, may cause bubbles. Great care should be taken to see that the acid solution is well mixed with the latex. The amount of acid (acetic) employed should not exceed 1 : 1200 of standardised latex. It is very easy to work out the amount of acid required for different volumes of latex, remembering that a gallon of latex weighs approximately 10 lb.

(e) Where the factory is too hot one runs a risk of a rise in temperature of the latex during coagulation. This might cause the formation of bubbles, especially where the amount of acid employed has been insufficient and hence the coagulation very slow.

(2) Rust. This defect becomes apparent as a white surface deposit upon the sheet when it is stretched. It is due to the presence of protein matter on the surface of the sheet which has settled out there from the serum. The washing, rolling and marking of the sheet squeezes out a greater part of the serum contained in the coagulum. If some of this serum is allowed to dry upon the sheet, the protein matter it contains is deposited there. When the sheet is smoked the presence of this "rust" is unnoticeable until the sheet is stretched. On stretching the rubber, the protein matter on the surface is broken up into a white powder, since it is inelastic

and thus becomes visible. It would seem that certain latices are more prone to give "rusts" than others. It will be obvious that the best way to get rid of "rust" will be to well wash the sheet after marking and then to well drain it so as to ensure that all water containing matter in solution is dripped off. For this washing, hot water is more effective than cold, and if the sheets are well washed in a jar of warm water (about the temperature of bath water) as soon as they leave the marking rollers and then placed on their edge to drain for a few minutes, until a sufficient number have been so treated, and then hung up in the open, very little trouble should be experienced with "rust."

(3) Defects under the heading of "dirt" rather point to insufficient care over the details of manufacture, though even from the most scrupulously clean factories sometimes the rubber turned out is reported on as being dirty. Great care should be taken over the sieving of the latex. No. 60 mesh is the most suitable gauze to use, and the tanks and more particularly the pans containing the latex should be carefully covered so that all dirt and dust are excluded. In some of the old attap-roofed coagulating sheds still in use on some estates it is a difficult matter to keep the sheet free from dirt and specks.

Smoke houses, too, are sometimes very dirty, especially those with open pit furnaces. The dust and ashes from the furnaces are often to be found all over the dry chamber, while on some estates it is the practice of the smoke house coolies to daily damp down the fires with water so that the rubber can be attended to; such a method causes clouds of dust to rise and settle on the rubber. Of course, where the rubber is surface dry such dust can easily be removed either by brushing or washing. Where, however, the rubber is damp and only freshly put in the smoke house more trouble may be experienced in cleaning the sheets from this dust. Another cause of trouble in the smoke house is the creosote drippings from the roof or beams which sometimes fall on the sheet and cause a black shiny streak down the surface of it. These streaks need very thorough washing in order to remove them and unless the selecting of the finished sheets is very carefully supervised, sheets bearing such marks may easily find their way into the case and spoil the whole consignment.

Blackened rods (those covered with a deposit of creosote) often cause a dirty mark across the sheets. All rods should be periodically cleaned. The uneven smoking of the sheet at the place where it is in contact with the rod, too, may detract from the general "pretty" appearance of the sheet. It is necessary to move the sheet during the first four days it is in the smoke house.

(4) "Undercured" or, in common language, incompletely dry, appears to be a favourite defect in sheet rubber as found by the brokers at the present time. The defect is demonstrated by cutting the sheet across when the incompletely dried portion in the centre of the sheet appears as an opaque layer. In the writer's experience it is possible to obtain something approaching opaqueness, or it perhaps could be better described as opalescence when many sheets, of fair thickness and darkly smoked, are cut across and the cut cross-section held at a certain angle to the light. Still, if the reader will take an incompletely dried sheet and cut it across he will be able to see the white opaque layer which the brokers protest that they can see in

one's sheet. The factors which affect and control the drying of sheet rubber are several. The ventilation in the smokehouse, the temperature at which smoking takes place, the hardness of the sheet (the amount of rolling which it has undergone, the rubber content of the latex used in making the sheet and the amount of acid employed in coagulation—all these factors appear to affect the hardness of the sheet), the thickness or thinness of the sheet, the evenness of the rolling—these are the principal factors which affect the rate of drying of the rubber.

In order to obtain a quickly drying sheet one must work with a latex not exceeding 1½ lb. rubber content per gallon. 1 lb. 6 ozs. gives a nice thinnish sheet. Care must be taken not to over-roll or surface harden the sheet. Once hand rolling, then twice through the smooth rollers, seeing that each of these rollings reduces the thickness of the rubber, and then once through the marker should give a sheet that is fairly soft and which will quickly dry. Care should be taken in rolling to obviate thickened edges, which will greatly prolong the normal time for the drying of the rubber. Where rubber has been rolled too much difficulty is often experienced in getting a satisfactory marking on the sheet. In smoking such sheets the pattern levels out to a large extent.

(5) The question of under or over smoking is a very difficult one to discuss for different brokers appear to have different standards for judging this matter. Some appear to favour a lightly smoked sheet while others prefer a more darkly coloured kind. At the present time it is possible that the darker smoked sheets are more generally preferred on account of the fact that rubber has to be stored for a long time and it is considered that the darker sheets are more thoroughly dry than the lighter coloured, and, therefore, less likely to become mouldy. The question of the colour of the finished smoked sheet is largely connected with the amount of acid employed in the coagulation of the rubber. The greater quantity of acid employed the lighter the colour of the sheet.

Over-heating of the sheet should be guarded against, and the temperature of the smoke house should be kept as constant as possible during smoking and should not exceed 125°F.

(6) Moulds growing on sheet rubber have caused great trouble to many managers. One is not so much worried by the appearance of moulds in one's smoke house or packing shed. The worrying part is when they occur on the rubber while in transit from the estate to Singapore or to London. The cause of the occurrence of moulds in the smoke house or packing shed, or even on the packed rubber while it is still on the estate, ought not to be difficult to find. In the smoke house it can be due to faulty ventilation or bad position of the building. The building may be of a bad shape, i.e., a low long building with the fires badly distributed. On top of these faults the smoke house coolies may be giving insufficient attention to the fires so that the temperature of the building may be falling considerably during the night. The moisture in the atmosphere then condenses out on the sheet, thus inviting the moulds to grow. The use of wet fuel may also contribute towards the risk of the occurrence of moulds, as also does the hanging of wet dripping sheet in the smoke house. The use of green (and therefore wet) bamboo rods for hanging the rubber has been the cause of

the growth of moulds in some smoke houses. Great care should be taken to see that the sheet is kept perfectly dry in the packing shed and that no water is spilt about, or wet sheet brought in contact with it. The momis, or whatever cases are employed for the packing of the rubber, should be carefully dried before use. Needless to say every care should be taken to keep the cases of rubber perfectly dry. It is possible that some of the trouble with moulds experienced by estates after the rubber has already left the estates may be due to the cases getting wet in transit to Singapore.

It is fairly certain, in the foregoing account of the defects which appear in sheet rubber, the reader may find some, even many, important omissions both in the enumeration of the defects and also in the methods for preventing them. Still, the writer hopes that what he has written will be of some little assistance to planters who are experiencing difficulties in turning out a faultless product. The suggestions given above are the results of several years' gleaning in trying to turn out a sheet to suit the demand of the market.

THE DEFECTS IN CREPE RUBBER.

This article has also been written specially to the Malayan Tin and Rubber Journal by the same writer of the previous article on "Defects in Prepared Rubber" and copied from that Journal, Vol. X, No. 13.

CREPE RUBBER.

The principal defects occurring in crepe rubber as reported by the brokers are :—

(1) Poor Colour
(2) Spotted with mould growths
(3) Streaky
(4) Tacky
(5) Dirty
(6) Lack of uniformity of colour

(1) Poor Colour.—The market demands that No. 1 crepe rubber should be of a palish yellow colour, and the only way to ensure obtaining this colour is by using a proper amount of good quality sodium bisulphite in the preparation. Where this salt is not employed the crepe darkens in colour due to the oxidation of the rubber, which goes on until the crepe is completely dry. The presence of sodium bisulphite in the rubber prevents this oxidation from going on. The amount of this salt usually employed is 1 lb. dissolved in 2 gallons of water and this solution is sufficient for 40 gallons of standardised latex (i.e., a common size of Shanghai jar full). The employment of a larger proportion of the salt than here mentioned will give no benefits, neither can the employment of inferior qualities of the salt be compensated by using larger quantities of it. The use of excessive quantities of sodium bisulphite in crepe making can be, and generally is, the source of trouble to those estates, following this practice. Too great a quantity of sodium bisulphite in crepe greatly retards the rate of drying and this has its attendant evils which will be considered later. Further, it leads to sodium sulphate—one of the decomposition products of the sodium bisulphite—working out of the finished rubber as a white powder at the edges of the crepe. Sodium

bisulphite deteriorates when exposed to the air, and thus drums of the salt which have been broken in transport should be looked upon with suspicion. The bleaching property of the sodium bisulphite is lost with the evolution of the sulphur dioxide gas and the sodium sulphate the compound which remains when the sodium bisulphite deteriorates, has no beneficial but only detrimental effect upon the crepe. It will thus be appreciated that where one is attempting to correct a poor quality of sodium bisulphite by using a larger quantity of it, that one is adding an excessive quantity of sodium sulphate to the rubber which retards the rate of drying and which may also spoil the finished crepe. It is far better to throw away bad sodium bisulphite ; the financial loss by so doing will be much less than if one persists in using it.

It will be obvious that the only safe way to be sure that one's supply of sodium bisulphite is of first grade quality is to have it analysed by a chemist. Indeed one might go further than that and state that it would be desirable that the substance should be sold under a guarantee of a certain percentage purity, say 90%, by the firms dealing in that commodity. This may be idealistic, still an analysis of the sodium bisulphite should be obtained as soon as the slightest trouble is experienced in getting a crepe of a satisfactory colour.

(2) Spotted with Mould Growths.—The appearance of fungoid spottings on crepe with their various colours, of which black, bluish-black and yellow are the chief, will be too well known to planters to need description. These spottings are due to the growth of fungi inside the crepe. Scientists inform us that the spores of these fungi are practically omnipresent and that they will develop on all crepes when their drying after manufacture is retarded. The rate of drying of crepe is the chief factor which decides whether one's crepe goes spotty or not, and therefore one should endeavour to so arrange matters that it dries as quickly as possible. The rate of drying of crepe rubber depends upon several factors of which the following are the principal :—

(a) *Thickness of the finished crepe.*—Thin crepe dries more quickly than thick crepe and a crepe of uniform thinness dries quicker than a "lumpy" crepe. If one examines a piece of spotty crepe one will generally find that the spottings are restricted to the thicker portions.

(b) *Excess of sodium bisulphite or the use of poor quality of sodium bisulphite.*—Sodium sulphate, the final compound left from the sodium bisulphite, will be incompletely washed out of the coagulum when excessive quantities of the latter salt are employed. This sodium sulphate holds up the moisture in the crepe and thus retards the drying.

(c) *The piling up of large quantities of freshly machined crepe* in the factory and allowing these piles to remain for several hours before the crepe is hung up. Such a procedure gives the fungal spores a fine chance to commence to develop. Crepe should be hung up as soon as possible after machining if one wishes to run no risks from "spots."

(d) Unsuitability of drying shed. The construction of an efficient drying shed is not a difficult matter though many estates have gone in for very elaborate, one might even say unnecessarily elaborate, buildings. The choice of the site for a drying shed should receive careful consideration, a dry airy place being essential. The building should be constructed so as to have an uninterrupted floor to roof ventilation. The lower two feet of the four walls of the building should be of expanded metal. The floor should be cemented and the building should be surrounded by a cement drain. There should be no space between the walls and the roof at the eaves, but the walls, and not expanded metal, should reach flush to the roof. The roof ventilation should be by jack roofs, either one long one stretching the whole length of the building or a number of short ones. No expanded metal should be put in half way up the walls (at the top of the ground storey) as such only spoils the ventilation of the building. Windows should be few in number, just sufficient for working purposes, and these should be kept close except when light is required in the building.

Attention to the above points will render the appearance of mould spots on crepe extremely unlikely.

(3) Streaky.—There are several kinds of streak defects found in crepe, arising from different causes. In the first place there is that streaky variation in colour of the crepe due to the bad mixing of the sodium bisulphite. In this case some small pockets of the coagulum undergo slight oxidation and these when macerated with the pale crepe appear as darker streaks in the crepe. Bad mixing of the sodium bisulphite includes both the mixing of the salt and water to form the original solution as well as the mixing of that solution with the latex. In the first place it is possible to conceive that where the salt is not properly mixed with water, one might add small particles of the solid undissolved salt to the latex and these would cause local differences of colour in the coagulum. A solution of sodium bisulphite is heavier than latex and therefore unless well mixed with the latex one could easily imagine the lower portion of the coagulum being a lighter colour than the top portion.

(4) Tacky Crepe.—Tackiness in crepe rubber is occasionally reported from Singapore Sometimes, however, "sticky" would better describe the condition of some crepe rather than "tacky." Stickiness in dried crepe is generally brought about by drying the rubber in an over-hot drying shed. Some inefficiently ventilated corrugated iron drying sheds get very hot during the day and it is possible that the crepe hanging close to the sun-baked walls and the roof may get over-heated. Often this stickiness is not apparent, or at least so little apparent that it is unsuspected, while the rubber is on the estate. It is after it has been stored for some time in cases—sometimes pressure is used in packing the crepe so that the cases are made to contain larger quantities—that the stickiness of the surfaces of the

crepe becomes apparent. The brokers then describe the rubber as "massed" for it is then difficult, sometimes impossible, to separate the pieces of crepe the one from the other. A greater over-heating of the crepe will produce tackiness as will also the exposure of the crepe to direct sunlight for a few hours. The presence of copper salts in the crepe produces tackiness, though it is probable that this cause of tackiness is less common now than in past years. Copper could be added to the rubber by using acetic acid which has been manufactured in copper vessels and by using machines fitted with copper rollers.

(5) Dirty Crepe.—In order to turn out a first-class crepe, every care must be taken to see that the factory is kept scrupulously clean. Small pieces of dirt falling on the coagulum eventually become mixed with it on maceration and then appear as long streaks of dirt in the finished crepe. Unless the machines are kept clean, oil and grease will squeeze out from the bearings along the rollers and contaminate the rubber. A small drop of grease mixed with the coagulum at the outset of the maceration will appear in the finished crepe as a long dirty streak, often green in colour from the copper worn from the bearings which it contains. Where rollers are too narrow and the machines are not kept very clean considerable trouble is often experienced by the dirt and oil from the sides of the machine coming in contact with the crepe in passing through the machine.

Where rollers are worn in the middle, the unworn ends often grind one against the other and the resulting iron dust which is worn off mixes with the rubber and appears as a dull greyish spot on the finished crepe. When rollers are allowed to run free, i.e., with no rubber passing through them, fine iron dust is often worn off, and this mixes with the coagulum and appears as a dull grey spot in the crepe. Care should be taken to wipe the rollers before clean coagulum is passed through them, especially when they have been allowed to run free.

(6) Lack of uniformity of colour. A variation in the colour of the crepe put into a case is liable to depreciate the value of that rubber in the eyes of the market. The only way to make sure that one's crepe will be of a uniform colour is to bulk the latices from the different fields and then to daily reduce to a given standard rubber content, say of $1\frac{3}{4}$ lb. per gallon. It will be obvious that where the latex is not standardised that a uniformity of product cannot be expected. One day one works with a latex whose rubber content is 2 lb. per gallon and the next day with a latex of $1\frac{1}{2}$ lb. per gallon. They both receive the same amount of acid and the same amount of sodium bisulphite per gallon with the result that the coagulum must vary in hardness, colour, etc., and the resulting crepes, if put through the rollers the same number of times will vary in thickness, rate of drying, while their colours will vary.

FOODSTUFFS.

CULTIVATION OF VEGETABLES IN HARISPATTU.

W. MOLEGODE,

Agricultural Instructor.

Hitherto practically all the vegetables that come into the Kandy market—anybody familiar with the "Market Days" viz. Mondays and Fridays would know the enormous supply that came in regularly—was drawn from Dumbara and Hewaheta, and it is pleasing to note that Harispattu has recently become as important a vegetable producing area and is contributing largely not only to the local supply but to the demands of further Upcountry and Colombo. Special attention was paid during the last 3 or 4 years to the subject of vegetable cultivation and the results so far achieved are highly satisfactory. Though it is impossible to make an accurate estimate of the output of vegetables in this area, a fair estimate has been made by close observation and frequent visits to the Katugastota market and, working on figures for the last 18 months, it could be stated that garden produce to the value of Rs. 2,500 pass through this market every week. The following is a detailed list of produce brought for sale on one particular day, viz. Thursday the 1st September, 1921 :—

Name of Produce	Quantity marketed	Average Selling Price	Total Value Rs. Cts.
Beans	380,000	40 cts. per 1,000	152·00
Cucumber	450	3 cts. each	13·50
Snake gourds	800	2/50 per 100	20·00
Brinjals	1,500	50 cts. per 100	7·50
Bandakka*	200	75 cts. per 100	1·50
Plantains	60 loads	10/- per load	600·00
Kohila	5 ,,	4/- ,,	20·00
Kan-Kun	3 ,,	1/50 ,,	4·50
Breadfruits	800 ,,	1/25 per 100	10·00
Lime	20,000 ,,	3/- ,, 1,000	60·00
Leaf Cabbage	1,600 bundles	1/50 per 100 bundles	24·00
Shallot†	700 ,,	3/- per 100 ,,	21·00

There has lately been an increased demand for all kinds of vegetables and garden produce. Owing to this demand and the satisfactory margin of profits obtained by growers, cultivation is extending and during the last two seasons the extent of land opened in vegetables and other garden crops was large. The cultivation of the ordinary French Beans which is carried on extensively in Harispattu was considerably augmented by utilising *Yala* fields

* Crop just coming in.

† Shallot is grown in Harispattu for the leaf and young bulbs which are used as a vegetable.

ploughed for Yala cultivation but not sown owing to the delay of the South-west Monsoon. The following are some of the chief varieties of vegetables grown extensively in Harispattu :—Bandakka *(Hibiscus esculentus)*, Dwarf French Beans *(Phaseolus vulgaris)*; Brinjal *(Solanum Melongena)*; Cucumber *(Cucumis sativus)*; Bitter gourd *(Memordica charantia)*; Onion, Shallot *(Allium ascalonicum)* for the leaf and young bulb for curry; Pumpkins *(Cucurbita* varieties), Water Spinach *Kan-kun (Ipomoe aquatica)*, Tannias *(Colacasia*, var); Kohila, Snake-gourd *(Trichosanthes anguina)*. The leaf cabbage is also commonly cultivated and has proved to be a profitable crop. It is a matter for regret that the plantain disease is gradually reducing the cultivation of plantain, and in some villages, noted for plantains only a couple of years back, the disease has completely killed out this crop.

Now that vegetable cultivation has spread and become a commercial proposition in Harispattu it is to be hoped that cultivation will be carried on systematically so as to get the best results. Five years back vegetable cultivation in Harispattu was carried on in a casual manner for the use of the grower and without the least thought of making any money on vegetable growing. A gardening competition organised for a part of Harispattu in the year 1917 gave an impetus which has been well maintained. Work in the direction of impressing the growers, that his chief aim should be to get the highest return from his land by better methods of cultivation, use of good seed and manuring has already commenced and must be continued by demonstrations. New lands for market gardening are few and far between in Harispattu. Intensive cultivation is the only possible thing if the present output is to be increased. Cultivators must be encouraged to maintain the fertility of the soil by practising proper tillage and judicious manuring. It is common knowledge that even the richest soil becomes impoverished by the continual growing of crops and the yields become poorer and poorer both in quality and quantity. This can be guarded against by manuring and adopting a proper rotation of crops and the fertility of the soil can not only be maintained but considerably improved. The necessary manure for vegetables are plentiful in the vegetable growing area and fertilisers could be obtained through the Co-operative Credit Society, Cattle manure, ash, keppitiya (*Croton lacciferum*) and Dadap leaves are well-known manures for vegetables. The first of these, cattle manure, contains almost all the necessary elements of plant food but sufficient care is not taken to conserve the good quality of the manure. Exposure to sun or rain reduces the value of cattle dung. It is therefore essential that if the best use of cattle manure is to be taken that it should be properly handled and stored. Keppitiya leaves are specially suitable for such crops as chillies, brinjals and betel. Wood-ash is largely used for gourds and pumpkins. Very little experience is available with regard to the use of artificial fertilisers on vegetable cultivation in Ceylon and it is therefore all the more necessary that experiments in this direction should be started at once, preferably in small sections of the existing large gardens. For successful vegetable cultivation a soil containing a good proportion of humus is essential and by the addition of bulky vegetable matter such as decayed leaves, straw, stable manure and by turning in the vegetable matter after the gathering of the crops the amount of humus can be increased. But whenever this is done a sprinkling of lime should be made. Cultivators must be also encouraged to adopt a rotation of crops.

ONION.

In the Bombay Presidency this crop occupies a very important place among the garden crops which have proved lucrative to the grower. It is very largely grown in the Nasik District in Surat, Broach, and in the Konkan at Alibag, Shriwardhan and Murud.

It consists of small roots which grow from a small bulb-like stem ; the bulb or the fleshy part where the food material is stored is not really the stem but is formed of leaves-botanically called Scales, the proper leaves are the green hollow tapering and more or less round leaves which appear above the ground.

Soil :—Medium black soil is the most suitable soil for the healthy growth of the crop. On goradu soils in Gujrat it does not grow satisfactorily. The soil must be rich in plant food and should be sufficiently porous to afford easy access for the tender roots, and not liable to become water-logged and sticky after irrigation. In other words stiff clay soils are not the proper soils for this crop ; in such soils onion bulbs do not grow large since the pressure of the soil obstructs growth and prevents them from thickening. Gorat soils in Gujrat are well suited for this crop.

Season :—The usual season of planting onions is from November to January but where good irrigation facilities exist the crop can be grown at any time throughout the year.

Raising of Seedlings :—This is an operation which requires considerable exercise of care and attention. The seedlings are raised in a specially prepared seed-bed. The soil is dug with a spade, the clods broken down, beds prepared and well rotted farmyard manure put in and thoroughly mixed with the soil. The beds should not be very large, a convenient size being 3 ft. by 5 ft. and they must be properly levelled. About 9-10 lb. of good seed is sufficient for one acre, when sown broadcast in the beds. To secure even distribution the seed is often mixed with ashes. Immediately after sowing the seed should be carefully and thinly covered with fine soil and watering should be done as soon as possible after this. The irrigation water should not be allowed to run rapidly and in a large volume as it is then liable to expose and carry away the seed to one extremity of the bed and also to destroy its surface level.

It is absolutely essential that the seedlings should be strong, vigorous, and healthy if a first class onion crop is to be secured. To obtain such a growth of the seedlings the addition of something which will place at their disposal immediately, easily and adequately available plant food is necessary. And taking into consideration the thick growth of the seedlings the need of available food becomes quite apparent. It is obvious that the raising of healthy seedlings is the first stage in producing a profitable crop and to secure this, artificial manures should be used in addition to the farmyard manure generally applied. For each seed bed one ounce each of nitrate of soda, sulphate of potash, and superphosphate should be thoroughly mixed together and broad-casted over the bed after the farmyard manure has been completely incorporated in the soil. The mixture of artificials should be forked into the soil to a depth of not more than three inches. This done the next operation is to broad-cast the seed, cover it and water the bed

carefully as already advised. The question of adequately nourishing the seedlings of any garden crop is of prime importance and particularly so in a crop having such a very high acreage value as the onion. Up to the present this point has not received the attention it deserves as being the first and most important step towards the realization of profit. One more point in connection with the application of these fertilizers might here be referred to. If ashes are added to the bed in sufficient quantity then sulphate of potash and superphosphate can be safely dispensed with and nitrate of soda alone can be profitably applied. The cost of this application would be three pies per bed, or thereabout.

Onion seeds germinate in about eight days. The seedlings require watering at an interval of four to eight days, depending upon the season and character of the soil in which they are being raised. It is essential that the beds should be kept quite clean of weeds. This may appear to be an insignificant point, but how often do we find that what are deemed small things are either the origin of big things or are regarded as insignificant because of our ignorance? The operations which are handed down to us by past generations of agriculturists were possibly not based on scientific knowledge but on the results of thousands of years' experience, and it is repeatedly found on enquiring that a large substratum of scientific truth underlies these old-fashioned methods. Several years' observation leads me to say that many important operations in agriculture are not properly attended to through poverty, ignorance and in some cases through negligence. To turn to the subject-matter in hand; the best time for transplanting the onion seedlings is when they are six inches high and when they are about a month and a half old. The seed-bed requires a thorough watering before they are pulled out for planting and this operation requires some care, the pulling should be carefully done so as not to injure the roots of the seedlings. The seedlings should then be washed in water in order to clear off the adhering soil from the roots, and kept in water in a bucket or in any other convenient utensil. If this cannot be done they should at least be wrapped up in a wet cloth. By doing so the seedlings are not exposed to the scorching heat of the sun and hence retain their vigour at the time of planting which work takes up a considerable time. Although this is such a simple precaution and so very beneficial it is seldom practised. The roots of the seedlings are pruned a little and if the seedlings are strong and well grown a little portion of the tips of the leaves is removed by twisting. The leaves should not be cut off but be twisted off. The reason for this is that twisting injures the tissue of the leaves and thus puts a check to the process of evaporation of the water from the injured portion. The object of twisting off the top portion of the leaves of large seedlings is to lessen the area of evaporation of water. The transplanted seedlings take a few days to become established in their new habitat and hence any strain upon their life activities would be harmful to them during this period.

Method of transplanting.—Assuming that the soil has been well prepared we will now consider the methods of planting that are in vogue.

The most common method is that of the flat bed. The seedlings here are planted in the soil first and are then watered immediately afterwards. The second method is to plant them on ridges prepared in the bed; here the

beds are watered first and then the seedlings are planted by pressing them with the thumb and finger into the soil. The latter method is not so satisfactory a method as the former because the planting work has to be done in water or in mud which destroys the texture of the soil, especially in the trampled places. The seedlings being pressed in the soil experience some difficulty in swelling out as they grow since the pressed place becomes very hard. In the first method water being given after transplantation presses the loose soil particles around the bulb of the seedling and thus establishes a natural capillary flow of water.

After the seedlings have been transplanted the next immediate operation is that of irrigating them. The work of irrigating the seedlings which are being transplanted is so done as to keep pace with the transplanting. The reason for this is that the seedlings, if kept for a long time in contact with the dry soil of the bed without water, are bound to suffer.

On the third day after the transplantation watering is done in order to invigorate the seedling. Subsequent irrigations are done according to the character of the soil and the season—in fact the interval may vary from four to ten days

Irrigation plays a most important part in the economy of plant life. On fruit trees especially its effects are most pronounced, and hence adoption of precautionary measures is absolutely necessary in applying waterings to crops in general. To have an approximate understanding of the proper requirement of water by the crop a close study of a few years is necessary.

In the case of onions excessive watering may result in the production of a poor crop with bad keeping qualities—succulence of the bulbs is not a satisfactory condition for keeping quality of the crop.

In the case of Mot irrigation the water does not rush fast so as to spoil the bunds and to expose the onion bulbs, but when the crop is being irrigated either by means of pump or canal water then there is every possibility of these two things occurring and hence the flow of the water is required to be brought under control. In order to avoid the aforesaid evils the current of water, if possible, should be distributed simultaneously among two or more beds. This arrangement will lessen the volume and consequently the speed of the water.

Weeding.—In general the exact uses of weeding are not properly understood and almost unknown is the recent discovery that plants, like human beings, prefer association of some plants, and show dislike to some others. In the presence of the latter group the crop fails to attain to that stage of development which is calculated to bring profit to the grower. For instance, the growth of the cabbage crop in the grape plantation affects the latter crop to such an extent as to make it a failure in respect to profit. This fact has been brought to notice by an American cultivator whose name I unfortunately forget. This circumstance has been known to our Indian cultivators for thousands of years, and hence weeding is done with great care and with promptitude by many farmers.

The weeds affect the crop in manifold ways, *viz.*, physically, physiologically, chemically and so on. Consequently they must be removed in time. It would be beyond the scope of the present article to deal in detail with the disadvantages of allowing the weeds to grow in the field, therefore I close

this section by relating that as onions require about six months to come to the stage of harvesting, about three weedings are done usually.

Manuring.—We come now to the most important phase in the cultivation of plants, because on the proper supply of nutrition to them depends the profit of the cultivator. In India farmyard manure is becoming scarce and in some places almost unobtainable. Many thoughtful men, both cultivators and those interested in the promotion of agricultural welfare, have been devoting their attention to overcoming this growing difficulty by finding out some substitute for farm manure and fortunately their efforts have become completely successful. Along with the organic manures such as oilcakes, fish, etc., the use of artificial fertilizers is increasing more and more as it becomes known that it is a paying proposition.

Nitrate of soda either alone or in addition to farmyard manure or in combination with Sulphate of Potash and Superphosphate has been giving results so constantly profitable as to pass beyond the stage of mere experiment and to come to that of certain benefit on many crops, and onion is one of them.

Let us now see the analytical figures of the substances entering into the composition of onion. The average composition of 30,000 lb. of onions is as follows :—

59 lb. of Nitrogen, 30 lb. of Phos. acid, and 118 lb. Potash.

This analysis does not include the figures of the leaves and are of the bulbs only which were air-dried.

To state the figures of a well-known investigator :—

	Nitrogen.	Phos. acid.	Potash.
Bulbs ...	80·4	45·0	52·5
Leaves ...	124·2	15·0	110·1
	204·6	60·0	162·6

Looking at these figures we get some idea as to what should be the composition of the feeding stuff. The percentage of Nitrogen and Potash in the leaves is considerably higher than that in the bulbs. And the percentage of Phos. acid in the bulbs far exceeds that of the leaves. From these figures it is evident that the manure to be added to onion must be rich in Nitrogen and Potash, Phos. acid being also a necessary ingredient.

If however, proper attention be not paid to this problem of manuring, the yield of the onion crop is bound to be affected as also the maintenance of the fertility of the soil, two points of vital importance to the agriculturist. Deficiency in the supply of food materials is a decided step towards poor crop production and the depletion of the soil of these ingredients, which becomes incapable of producing other profitable crops. Hence if the cultivator is required to spend some extra amount of money for these fertilizing ingredients he should not hesitate, inasmuch as he not only obtains more profit by doing so but also maintains the proper tone of the soil.

A question may arise in the minds of some as to what is the necessity for the application of the fertilizers to this crop : would not a larger application of farm manure serve the purpose ? To answer this is easy. First of all I have already said that farm manure is becoming scarce and we are

experiencing difficulty in getting adequate manure and also in finding a substitute or a supplementary manure for same. Hence the addition of more farm manure becomes out of the question. Secondly, successive additions of farm manure in large quantities does not do good to the soil as well as to the crop; since onions are harvested within a period of six months the availability of the plant food must be rapid and easy. Besides this it is a wise policy to invest money where its return is quick, where it gives quick and maximum profit and this condition is fulfilled by the use of artificial fertilizers. Thirdly, and obviously, the experiments hitherto conducted in India and in foreign countries unanimously show that the application of the artificials does become profitable; then there remains no ground for any complaint against the use of them. There are other reasons but I do not care to occupy more space for this question.

I now proceed to state the experiments by way of illustration. These have been made by the Agricultural Department, Bombay Presidency.

Twenty carts of farm yard manure are added in the month of June, that is, just before the beginning of the rainy-season. And Nitrate of Soda alone or the complete mixture is given as a top-dressing to the seedlings after they become established after transplantation.

Poona District (Experiments at Loni and Junnar.)

	Cost of Manure per acre.	Yield of onions per acre	Values less cost of Manures per acre.		
	Rs.	lb.	Rs.	A.	P.
20 carts Farm Yard Manure per acre were added* 1. Complete mixture	36	21,174	105	0	0
2. Nitrate of Soda (285 lb. per acre) alone - -	27	16,500	83	0	0
3. Local manure alone - -	—	11,653	77	11	0

* The complete mixture consists of the following:

Nitrate of Soda -	-	- 285 lb. per acre
Superphosphate -	-	- 112 lb. per acre
Sulphate of Potash	-	- 56 lb. per acre

Experiments Conducted at Nadiad, District Kaira, Guzrat, 1920-21.

	Yield of onions per acre	Yield in excess by the addition of Nitrate of Soda per acre	Net Profit per acre.		
			Rs.	A.	P.
(1) Nitrate of Soda alone 400 lb. per acre - -	11,930 lb.	6,430 lb	147	0	0
(2) Nitrate of Soda alone 200 lb. per acre - -	8,000 ,,	5,200 ,,	108	5	0
(3) Local Manure - -	5,500 ,,	—	69	8	6

In the second set of experiments made at Nadiad the plots treated with Nitrate of Soda did not receive any application of local manure but the fertilizer was applied alone and not in addition to the local manure.

Experiment Conducted in Broach District, Guzrat, 1920-21.

	Yield of onions per acre.	Increase in yield by Nitrate of Soda per acre.	Net Profit per acre
Nitrate of Soda 400 lb. and F.Y.M. 9 tons ...	37,333 lb.	5,333 lb.	Rs. A. P. 41 0 0
Local Manure 9 tons ...	32,000 ,,	—	—

The Experiments quoted above should be regarded as a guide to manuring the Crop.

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IMPROVEMENT OF RICE BY SELECTION AND HYBRIDISATION IN JAVA.

P. VIELLARD.

The methods of selection employed at Buitenzorg on the same lines as those employed at Svalof for the cereals in Northern Europe are based on the following facts, in accordance with botanical and genetical theories held by a large number of specialists :

(1) The cultivated varieties of rice (these should not be confused with botanical varieties) include a considerable number of fixed strains, similar to those known in the botanical world under the name of "sub-species" or "Jordan species."

(2) Each of these strains differs from the surrounding types of the same variety in characters of negligible importance morphologically, but which mean a great deal from the cultural standpoint, (e.g. : yield, early maturity, resistance to disease, etc.) These distinctive characters are admittedly entirely transmissible to progeny.

(3) Compared with the habit of several other cereals, self-pollination is the usual habit with rice, and cross-pollination is very rare. This certainly facilitates to a large extent the process of selection, as it permits close spacing, and of several pure lines coming from the same or different varieties, without running the risk of undesirable crosses.

It is easy to see, therefore, that if a cultural variety is selected which shows a combination of good characters (weight of yield, quality of grain, resistance to disease), or which possesses one of these points to a marked extent, it will be sufficient to multiply a pure line to obtain several generations later, a new cultural variety following the natural course, but with the advantage of each individual possessing qualities of a select strain superior in one form or another to the original variety ("population").

The following is a brief survey of the method employed in Java at Tjikenmeuh.

The "population" rice is sown in the nursery according to the usual custom, and then pricked out on to an area of about 20 acres, with much care taken to avoid putting more than one plant into each hole. Throughout the growing period, the rice field is watched, and out of the 100,000 to 200,000 plants thus pricked out, about 300 select types are chosen.

The record of the yield of each plant is made separately. In the laboratory, the less interesting ones are eliminated, and about 75 to 80 in all, are conserved. These will form the origin of the pure line selection.

The following year, each of the 75 to 80 lines thus obtained is sown and repicked out, always at equal distances apart, on small plots (4·7 to 7 sq. yards). Three plots at least, are reserved for each line and these are distributed in various quarters of the field, so as to avoid variations due to dissimilarity of soil. In the harvest season, the produce from all the plots is collected at the same time. In this way 75 to 80 crops are obtained, and these are investigated in the laboratory according to the characters it is desirable to retain.

The third year, work is not continued with the 10 to 15 best lines in the second selection, but this time the plots reserved for each line are multiplied as far as possible. The crops thereby obtained serve as a base for the definite choice of the type, or types, which will advantageously take the place of the original "population."

At Java, up to the present time, a dozen varieties have undergone this method of selection and have furnished twenty pure lines. These lines multiplied over large areas, for the last 2 or 3 years in control plots have shown homogenicity and fixed characters as expected. With regard to the yield, there was an average increase of 20%.

It is noticeable, as predicted, that the results obtained showed a distinct improvement to the original and less homogenous population.

The Tjikenmeuh Station is assisted in plant breeding work by the co-operation of the "Jardins de semences" directed by M. VANDER STOCK, and the work extends over the centre and east of Java and to demonstration fields at the local agricultural schools. It is reasonable, therefore to hope that the results, already distinctly advantageous, will be accentuated and confirmed in the near future.

The author gives a brief survey of the hybridisation experiments made at Tjikenmeuh.

Artificial pollination of rice is a somewhat difficult operation which was for a long time considered impossible.

M. VAN DER STOCK, who was the first to succeed, has, however, never obtained more than a very minor degree of success. The local varieties, crossed 7 years before and with progeny followed with great care up to the present times are "Skriviman Koti" and "Carolina." The first is a plant of very considerable vigour, leaves dark green, form erect. The yield is high but unfortunately the grain is of an inferior quality. The second variety, on the contrary, shows lack of vigour, the leaves are large, light green and drooping, but it makes up for this by producing grain, although in poor quantities, of the biggest and best quality obtainable in Java and perhaps even in the whole world. The flowering period is 3 weeks earlier than that of Skriviman Koti.

Hybrids are selected in each generation. F^7 under the authors' observation gave more than 200 hybrids cultivated on plots of an average area of 7 sq. yd., and which showed a combination of character of the 2 parents. In several cases "transgression" was noted.

Certain hybrids flowered 8 days earlier than Carolina (the variety which matures the quicker of the 2 parents). Others gave larger grain than Carolina. These facts are sufficiently encouraging to raise hopes, and the confirmation of the results obtained at Tjikenmeuh will open up an efficient means of action to rice breeders for the improvement of local varieties, by crossing with superior important varieties.—MONTHLY BUL. OF AGRIC. INTELLIGENCE AND PLANT DISEASES, YEAR XI, No. 5.

COCO

COCONUT TRIAL

The following statement prepared by **Messrs. George Steuart & Co.**, methods of treatment at Coconut Trial Grounds.

No. of Field	No. of Palms	TREATMENT	Yield per palm in 1915	1916		Yield per palm
				Yield per palm	Percentage increase or decrease as compared with 1915	
		Rainfall ...	53·33" in 86 days	64·69 inches in 88 days		
1	47	Clean Weeding	41·1	57·	39%	69·2
2	72	Sulphate of ammonia 2½ lb. per palm in 1915 ... Disc harrowed monthly 1916 and 1917 ... ,, ,, 10 times 1918 and 1919 ... ,, ,, 7 ,, 1920 ..	38·9	66·8	72%	73·1
3	89	Groundnut Cake 6 lb. per palm 1915. Crushed Fish 6 lb. per palm in 1916, 1917, 1918, 1919, 1920	40·2	56·3	40%	58·6
4	81	Steamed Bone Meal 8 lb. per palm in 1915, 1916, 1917, 1918, 1919 and 1920 ...	54·7	71·6	31%	69·7
5	84	Sulphate of Potash 2¾ lb. per palm in 1915, 1916, 1917. Mendis Potash 5 lb. per palm 1918, 1919. Sulphate of Potash 3 lb. 1920 ..	42·2	62·2	47%	67·7
6	78	Ammonium Sulphate 4 lb. per palm in 1915, 1916 and 1917. Mendis Potash 5 lb. per palm 1918 Sulphate of Ammonia 4 lb. per palm in 1919, 1920	49·0	52·2	7%	65·5
7	92	Mineral Mixture 6 lb. per palm in 1915, 1916, 1917 Mineral Mixture 7 lb. 2 oz. per palm in 1918, 1919 Mineral Mixture 6 lb. in 1920 ..	35·9	51·2	42%	60·7
8	68	Lime 10 tons per acre 1915, 1916 and 1917 ... ,, ⅓ ton in 1918, 1919 and 1920 ..	39·3	48·6	23%	59·6
9	85	Mixed Manure 10 lb. per palm in 1915, 1916, 1917 Organic Mixture 12 lb. 4 oz. per palm in 1918 and 1919, 10 lb. 2 oz in 1920 ...	39·8	52·9	33%	64·2
10	107	Mulched with husks in 1915. No treatment subsequently beyond clean weeding around trees ...	27·4	43·1	57%	42·7
11	100	ulched with husks in rings round palms. Dug in 1920	28·6	42·9	50%	37·1
12	101	Ploughed and disced	29·1	46·4	59%	37·3
13	99	Ploughed and disced. Mixed Manure 1917 ... Organic Mixture 12 lb. 4 oz. per palm 1918, 1919 10 lb. 2 oz. in 1920	18·7	37·3	99%	34·1
14	46	Dug with Mamoty and mulched with leaves. From 1919 mulch removed and plot harrowed in 1919, 10 times and in 1920, 7 times ...	18·4	50·0	171%	44·6
15	81	Watered. Watering stopped in 1919 and lime applied at the rate of ½ ton per plot, similar applications made in 1920		38·1	—	25·8
16	59	No treatment, Store, etc.	40·2	54·6	35%	51·7

NUTS.

GROUNDS, CHILAW.

Colombo, giving further details of the results obtained by the various Chilaw, will be of interest to coconut Growers:—

1917		1918			1919			1920			Average yield per palm for 5 years with treatment nuts	Increase as compared with 1915 Percentage and nuts per palm
Percentage increase or *decrease* as compared with		Yield per palm	Percentage increase or *decrease* as compared with		Yield per palm	Percentage increase or *decrease* as compared with		Yield per palm	Percentage increase or *decrease* as compared with			
1915	1916		1915	1917		1915	1918		1915	1919		
41·66 inches			51·78 inches			54·99 inches			69·50 inches			
in 75 days			in 76 days			in 100 days			in 95 days			
68%	21%	75·5	83%	9%	51·6	25%	*32%*	53·1	29%	3%	61	48% 20
88%	9%	70·6	81%	*3%*	56·4	45%	*20%*	56·4	45%	—	65	66% 26
45%	4%	58·7	46%	—	49·6	23%	*15%*	54·1	34%	9%	55	37% 15
27%	*3%*	74·0	35%	6%	60·3	10%	*19%*	64·7	18%	7%	68	24% 13
60%	9%	57·9	37%	*14%*	46·3	9%	*20%*	58·9	39%	27%	58	38% 16
34%	25%	65·3	33%	—	51·8	6%	*21%*	66·1	35%	27%	60	22% 11
69%	18%	58·6	63%	*3%*	44·2	23%	*25%*	55·2	54%	25%	54	50% 18
51%	22%	72·1	83%	21%	47·8	21%	*34%*	49·7	26%	4%	55	41% 16
61%	21%	59·9	50%	*7%*	42·2	6%	*20%*	52·7	32%	25%	54	38% 15
56%	*1%*	28·2	3%	*34%*	18·9	*30%*	*33%*	30·9	13%	64%	33	22% 6
30%	*13%*	22·7	*20%*	*39%*	15·8	*44%*	*30%*	30·9	8%	95%	30	4% 1
28%	*20%*	33·4	15%	*10%*	20·9	*28%*	*37%*	35·9	23%	71%	35	20% 6
82%	9%	32·6	74%	4%	20·6	10%	*37%*	42·4	126%	106%	33	80% 15
142%	*11%*	47·7	159%	*7%*	29·8	62%	*37%*	40·6	120%	36%	42	130% 24
		as compared with 1916		1917	as compared with 1916		1918	as compared with 1916		1919		—
—	*32%*	25·0	*34%*	*3%*	16·5	*56%*	*34%*	31·0	*18%*	88%	—	
28%	*5%*	53·4	32%	3%	48·1	19%	*10%*	46·3	15%	*4%*	51	27% 11

AGRICULTURAL EDUCATION.

THE SCHOOL OF TROPICAL AGRICULTURE, PERADENIYA.

OPENING OF THE NEW BUILDINGS BY HIS EXCELLENCY THE GOVERNOR, AND DISTRIBUTION OF PRIZES BY LADY MANNING.

The opening of the new buildings of the School of Tropical Agriculture, Peradeniya, took place at 4-15 p.m. on Saturday the 24th September, 1921. By 4 o'clock a large and representative gathering had assembled on the lawn opposite the new buildings. His Excellency the Governor and Lady Manning, accompanied by Capt. F. R. S. de la Cour, A.D.C., and the Hon. Robert Trefusis, Private Secretary, were received by the Hon. Mr. F. A. Stockdale, Director of Agriculture. His Excellency went up the steps leading to the new buildings, and standing at the entrance declared the buildings open.

HIS EXCELLENCY'S SPEECH.

His Excellency the Governor said: Mr. Stockdale, members of the Department of Agriculture, and ladies and gentlemen,—I have great pleasure to-day in being present to declare the School buildings of the Department of Agriculture to be open, and I sincerely trust, as I am sure many of you here trust, that this School of Tropical Agriculture may eventually develop into the College of Agriculture of Ceylon. (Applause.) Now, I am glad that it has been my opportunity during my tenure of office here, to extend the facilities for this School of Tropical Agriculture. We have succeeded, I am glad to say, with the aid of the Legislative Council, and with the strong assistance of the Director of Agriculture, in largely extending the area for the trials and experiments in practical agriculture, and I believe, and I can see that you believe also, that this School is going to be the foundation for a College of Tropical Agriculture. Now, what pleases me a great deal is that this School caters for many sections of society in Ceylon. It caters for the school teacher in the Vernacular; it also looks after the village headman, and it takes charge of the agricultural student. Now, I am confident that in these various classes there will be a diffusion of agricultural knowledge throughout the country. I have on more than one occasion commented upon the difficulty that there is (and I have no doubt many of you know it too), in breaking down the prejudices of the customs set up by centuries of practice in age-worn methods of agriculture. And my opinion is, and I am sure it is the opinion of many of you, who are here to-day and who are interested in agriculture, that practical demonstration is the only way of overcoming these prejudices, and that by practical demonstration modern methods must be shown to be superior to the efforts of our forefathers in

agriculture. Now I speak with a certain amount of knowledge of the ways of agriculturists, not only in Ceylon, but in other parts of the world. We know that of all conservatives, the most conservative I fancy is the agriculturist, and I trust that such a School as this will do a great deal to spread the gospel of the greater necessity for greater attention to the modern scientific methods of agriculture. I would particularly refer to the necessity for increasing and fostering the food productiveness of this island. Then there comes the other side of the question and that is the training of those who will eventually be, and who are, the owners of land, and those who desire to take up agriculture as a profession and a profession in which they naturally expect to earn their means of livelihood. I feel myself that to both these classes this School will be a great boon. I am also much satisfied to hear that the planting community are now applying to this School for assistants. Now I am of opinion, and I have held that opinion for a long time, that agriculture in its professional requirements is very closely allied to the human body. We know that for the welfare of the human body, we have occasionally to call in, what we call the general practitioner, and he, after diagnosing our case very often says that he must call in what we call a specialist in connection with our disease. He asks for the advice of the specialist. Such a state of affairs is existent also in the science of agriculture. There must be a number of specialists who are ready to deal with the various ills that affect plant life, and it is in this connection that I note with great pleasure that Mr. Hulugalle, a member of this staff, has been selected to proceed to Cambridge, and there to further prosecute the study of higher agricultural science. Then I also notice that Mr. Ragunathan has been transferred to the division of Mycology in the Department. Now, I want through these words to preach a little moral. I have often heard it stated, and I also see it written in articles in the Press, that the other professions, those professions of law and of medicine, are well stocked and it is my opinion that in the agricultural profession there is promise of remuneration, and of good remuneration, and there is also certain promise of employment. And there is no reason whatever why the Ceylonese in the future should not aspire to fill those specialist appointments required to deal with the diseases which affect plant life. (Hear, hear.) Now, I need not tell you, for you know it yourself, that the Ceylonese have proved themselves capable of attaining the highest rank in dealing as specialists of the ills that affect the human body (applause); and in my opinion they have now before them a fresh field for attaining a similar rank in another great profession and that is the profession of agriculture. (Applause.) I hope that these students who are present here to-day will bear these remarks of mine in mind. Hitherto, if I am correct in saying so, Ceylonese students have not attained this high rank in agricultural professions to which they are capable of attaining. I believe these students are well adapted to take over these specialist duties which they will be well able to fill. I see also in connection with the syllabus of the work of the school, you have a department which deals with accounts. Now, accounts whether they are accounts in connection with Government or with the ordinary work of the estate are of the first importance, and I am glad to say that the addition to the ordinary work in connection with the teaching of agricultural science, accounting is

also given a place. I am very pleased to see to-day the generous way in which the general public have come forward to give prizes and awards to this college. I have, standing by me at the present moment, two very generous donors, Gate Mudaliyar Rajapakse and Mr. H. L. De Mel. (Hear, hear.) Mr. Rajapakse is I know one of the leading Ceylonese agriculturists, always ready to do what he can to forward the agricultural interests of this Island. (Applause.) And I have by me Mr. De Mel, who you all know, also to whom as one of the leading members of the old Agricultural Society and at present on the Agricultural Board, agriculturists owe a debt of gratitude. But I am horrified to discover that I, who preached so much as to the necessity of greater attention to agriculture, am not included as one of the prize-givers. The only reason I can impute why I am not there, is that possibly having been so absorbed during the last few weeks in trying to prove that 3 and 2 make 7½, (Laughter.) I have missed the opportunity of being added to that list. The Director of Agriculture has missed his opportunity of seeing that my name is there. However, I can assure you that it shall not occur again and I therefore charge the Director of Agriculture with the business of establishing an annual Governor's prize (applause), and of seeing that he gets the cash from me for it. (Laughter.) Now, I must in conclusion, express my personal appreciation of the work of the staff, and I must also congratulate them on the clear lines of their work, and I hope, as I said before, that they are laying the foundations for our Agricultural College in Ceylon. It will be a blessing to this island and I feel confident that their work here will revolutionize the present system of agriculture (applause), and will likewise prove a blessing to this island. I endorse the appeal made to proprietary-planters to give an opportunity to students trained here of showing their real worth, and also I endorse the appeal to agriculturists to send their sons here for technical training before placing them in positions of responsibility. I think that the thanks of the whole community are due to Mr. Stockdale and to the members of the Agricultural Department (applause), for the breadth of view shown in laying down a scheme for the work of the School. It is to benefit all classes, from the landed-proprietor to the village tiller, and Mr. Stockdale deserves that this scheme should be a success and a permanent memorial as I am sure it will be, of the founder of it. I have now great pleasure in declaring the new School buildings to be open.

The gathering then repaired to the lawn, behind the School, where the prize-giving took place.

THE PRIZE-GIVING.

His Excellency the Governor presided at the prize-giving, and associated with him were Lady Manning, Sir Anton Bertram, the Hon. Mr. F. A. Stockdale, the Hon. Mr. A. C. G. Wijeyekoon, the Hon. Mr. H. L. De Mel, C.B.E., the Hon. Robert Trefusis, Capt. de la Cour, and Mr. St. L. H. de Zylva (Registrar.)

The Hon. Mr. Stockdale read the following report :

THE REPORT.

This day marks a further advance in Agricultural Education in the Colony. His Excellency has declared open the School buildings, comprising laboratory, library and lecture rooms, for the School of Tropical Agriculture,

AGRICULTURAL SCHOOL, PERADENIYA.
School and Laboratory Building opened by
HIS EXCELLENCY SIR WILLIAM MANNING, G.C.M.G.

AGRICULTURAL SCHOOL, PERADENIYA.
Hostel Building.

AGRICULTURAL SCHOOL, PERADENIYA
Millet in Students Plots, March, 1921.

AGRICULTURAL SCHOOL, PERADENIYA.
First year Students Plots.—September, 1921.

at Peradeniya. The school now has a permanent home and has buildings and land provided for its requirements.

A beginning has been made with laying out the property and a plan showing the different cultivations is to be seen on the tables of the laboratory. Additions have been made to the hostel, residences for the staff erected, stores built and a milk-room completed in anticipation of a small herd of dairy cattle to be attached to the school. The students have paid particular attention to plot work and I would ask visitors this afternoon to inspect the work of 1st year students, teachers and headmen on plots and the paddy field which has been re-modelled and recently tilled, manured and transplanted by Students of the School.

Our last gathering for Prize Day was held on September 25th, 1920, in these grounds. Since then two courses of instruction have been completed and three others begun. In December 1920 a class of 13 Teachers from Government Vernacular Schools completed a one year's course of instruction in agriculture, nature knowledge and school garden work. In March 1921, 19 students completed the full course of 2 years in English. Commencing with this year, all classes have been admitted in the month of May, in which month the School Year begins. In May 1921 three classes were admitted, viz., a class of 17 students for the English Two Years' Course ending in March 1923, a class of 12 Government Teachers from village schools for a one year's course in Sinhalese ending in March 1922, and a class of 11 Village Headmen—8 Sinhalese and 3 Tamil—for an 8-months' course ending in December next. There are at present in session 5 classes numbering 54 students.

In the major English course completed last March, 12 candidates were successful in obtaining the Full Certificates of the School, one has obtained the Certificate excluding Estate Accounts, four others a Partial Certificate, while two students failed. It is to this class that awards are to-day being presented. The Class began in May 1919 with 21 students. The Gold Medal and ten prizes of books have all been presented to the School by prominent Ceylonese members of the Agricultural community in the Island—two of whom are passed students of the School.

Employment: 114 men have already completed an Agricultural training here and obtained a Certificate, in the four English Courses given so far. Of these, 26 have gone back to the development of their lands, 37 are at present employed upon Estates in the Colony, and 35 are employed in the Agricultural Services of Government, 5 of these last, after further specialised training in India. It has become more general for the planting community to apply to the School when in need of Assistants.

The one year's course given in 1920 to Vernacular School Teachers was modelled on previous courses, and consisted of the instruction in the Vernacular of the 1st Year of the major course, modified to suit village conditions. Teachers for the course were selected by the Director of Education who also awarded 3 medals, one silver and two bronze, for competition. All 13 Teachers completed the course satisfactorily and were awarded the School Certificate for the Vernacular Course. The medals and certificates awarded to this class have already been presented to these men through the Department of Education, at the end of their course in December last. All 13 men

have since been re-appointed to schools with gardens. Whilst these teachers were under training they diligently devoted themselves to their work, and their practical work on plots was commendable. 45 Village School Teachers have now completed a course of agricultural training at Peradeniya. Five of these men have been appointed to Vernacular Agricultural Instructorships the remaining 40 are attached to schools in all parts of the Island ; and the reports of Inspectors show that these men have profited by their courses.

Courses for Headmen are given in alternate years. No course was given in 1920. In May, 1921, 11 men selected by the Government Agents were admitted and these represent six provinces and ten districts. With the 11 men now in attendance 50 Headmen—44 Sinhalese and 6 Tamil—have received training in Agriculture at Peradeniya. The present class comprises one Korala, one Registrar of Births, Marriages and Deaths, one Arachchi, 4 Police Vidanes, 2 Vel Vidanes, and 2 native writers. The course for Headmen is given entirely in the Vernacular : it is shorter and more elementary than that given to School Teachers.

School Tours :—In February the Annual Tour of the School lasting one week was made by all students in session, in the Anuradhapura and Jaffna Districts. Free travelling was provided by Government on railways. Facilities were also given for the school to visit the Heneratgoda Pageant in August ; and 2nd year Students were taken to Kurunegala in June to see the Tractor Trials on Clovis Estate.

Applications :—Enquiries regarding the work of the School continue to be received from Ceylon and elsewhere. Applications for admission are made generally by those directly interested in land, but include a few who seek professional training.

Staff :—It is a matter of gratification to the School Staff that Mr. G. E. J. Hulugalle, has been selected for a Government Scholarship to Cambridge University for further studies in Agricultural Science.

Mr. C. Ragunathan was transferred in October last to the Division of Mycology ; and Mr. C. Wickremaratne has been temporarily attached to the School for the Vernacular Work from the same date.

Others who have carried on work with the School are the Manager, Experiment Station, Peradeniya, the Curator, Royal Botanic Gardens, and the Secretary, Board of Control, Co-operative Credit Societies. The examinations of the School have been carried out by the senior officers of the Department in collaboration with the School Staff, and to these officers the thanks of the School are due for their work.

We have to record with regret the death, after a short illness, on the 8th instant, of Mr. D. Clement de Silva, Chief Clerk of New Peradeniya Estate and Lecturer in Accounts to the School since its inception in 1916. The course given by Mr. de Silva was approved by the most experienced members of the planting community ; it was practical and thorough and the men trained by him are in several cases in sole charge of the books of estates, and speak highly of the value of the instruction received.

Equipment :—Irene Estate continues to be worked entirely by the School and definite progress has been made in the laying out of the various sections

of cultivation though much has yet to be done. A cart-road has been built traversing the major part of the estate. The tracing of this road was done by the Students under the supervision of Mr. J. C. Drieberg. With the alteration and refitment of the main building—once "Irene House"—all English Classes have Hostel accommodation on the spot.

Students :—Facilities are provided at Peradeniya for Tennis, Cricket and Volley Ball. Football is played by arrangement in Kandy.

The "Peradeniyan," the School Magazine, has issued its 5th number.

An "Old Boys' Union" has been formed to further the interests of students who pass out of the School and help to keep them in touch with the School. It has celebrated its first annual gathering earlier.

General :—"The Rajapakse Gold Medal" for the best all round student of the Course is again awarded to-day, thanks to the interest and generosity of Gate Mudaliyar A. E. Rajapakse, who has given his practical support to the School in many ways from the beginning. The prizes being presented to-day have been provided by the generosity, no less encouraging, of Sir Solomon Dias Bandaranaike, Kt., the Hon. Dr. H. M. Fernando, the Hon. Mr. H. L. De Mel, C.B.E., Mr. Richard Salgado, Mr. C. W. Bibile, Ratemahatmaya; Mr. A. J. R de Soysa, Mr. Graham Pandittasekera, Mr. W. A. de Silva, Mr. J. C. Ratwatte and Muhandiram N. Wickremaratne. To all these gentlemen the thanks of the School are now tendered.

To His Excellency the Governor and to Lady Manning I have to accord a hearty welcome on behalf of the School. I have to thank you, Sir, for opening the School building and for presiding over the Prize-giving, and I have to thank Lady Manning for so kindly consenting to distribute the Awards and Certificates.

To the speakers of to-day I have, on behalf of the School, to convey our thanks. The Hon. Mr. H. L. De Mel has identified himself largely with the best interests of the School and takes an interest in finding employment for those students who have passed through the School. His Lordship the Chief Justice, Sir Anton Bertram, gave an address to the school when it was inaugurated in temporary buildings. To-day he has come to see it enter into a permanent and fuller equipment.

To all our visitors I would extend a cordial invitation to inspect the work of the School at the close of these proceedings.

We are now equipped to discharge more efficiently one of the fundamental needs of the Colony and it is to the interest of all of us that this institution should receive the co-operation and support of the agricultural public. The School still has its wants, but these I need not enumerate to-day. I cannot close however without appealing to proprietary planters to give students trained at the School an opportunity of showing their real worth and to agriculturists to send their sons for a technical training before they place them in posts of responsibility.

F. A. STOCKDALE,
Director of Agriculture, and
Principal, School of Tropical Agriculture.

Peradeniya, September 24, 1921.

Lady Manning gave away the prizes and certificates. The following is the list :—

AWARDS.

Medals.

"The Rajapakse Gold Medal," for the best all-round student of the course, presented by Gate Mudaliyar A. E. Rajapakse, J.P., awarded to Dharshanikumara Rajasinha Michael Rajapakse.

Prizes.

For Agriculture :—

1st—"The Dias Bandaranaike Prize," presented by Sir Solomon Dias Bandaranaike, Kt., awarded to Dharshanikumara Rajasinha Michael Rajapakse.

2nd—"The De Soysa Prize," presented by A. J. R. de Soysa, Esq. awarded to Vidanalage Cyril Antonius de Mel.

For Agricultural Botany :—

1st—"The Bibile Prize," presented by C. W. Bibile, Esq., R.M., awarded to Reginald Stanley Donald Jansz.

2nd—"The Pandittasekera Prize," presented by Graham Pandittasekera, Esq., awarded to Thurayappa James Jayarettnam.

For Agricultural Zoology :—

1st—"The Salgado Prize," presented by R. Salgado, Esq., awarded to Dharshanikumara Rajasinha Michael Rajapakse.

2nd—"The Ratwatte Prize," presented by J. C. Ratwatte, Esq., awarded to Meera Lebbe Mohamed Ali.

For Agricultural Chemistry :—

1st—"The Fernando Prize," presented by the Hon. Dr. H. M. Fernando, awarded to Meera Lebbe Mohamed Ali.

2nd—"The De Silva Prize," presented by W. A. de Silva, Esq., awarded to Andrew Sabapathipillai Dharmaratnam.

For Agricultural Economics :—

1st—"The De Mel Prize," presented by the Hon. Mr. H. L. De Mel, C.B.E., awarded to Thamotheram Vellupillai Thamotheram.

2nd—"The Wickremaratne Prize," presented by Muhandiram N. Wickremaratne, awarded to Thurayappa James Jayarettnam.

CERTIFICATES.

Class 1.—Andrew Sabapathipillai Dharmaratnam ; Dharshanikumara Rajasinha Michael Rajapakse.

Class 2.—Meera Lebbe Mohamed Ali ; Reginald Stanley Donald Jansz ; Thurayappa James Jayarettnam ; Sinnethamby Sinnathurai ; Thamotheram Vellupillai Thamotheram ; Edmund Thomas Wilfred Wijeyanayake.

Pass.—Vidanaralage Cyril Antonius de Mel ; Joubert de Silva ; Stephen Philip Fernando ; Lionel Wilfred Mendis :* Adrian Charles Walter Sirimane.

Partial Certificate.—Widaneralage Peter de Silva ; Abdul Hamid Hashim ; Rajaratnam Sabaratnam Payson ; Ratnapala Rajapaksa Senanayake.

SIR ANTON BERTRAM'S SPEECH.

After Lady Manning had distributed the prizes, Sir Anton, rising amidst applause, said :—

Your Excellency, ladies and gentlemen,—I see from the programme that my friend Mr. H. L. De Mel and I who have just been delivering our souls at a luncheon across the way, are called upon to deliver them again in a further measure. It is certainly a very great pleasure to me to come here to-day and to contrast the condition of the School with what it was five-and-a-half years ago, when I came to attend at the opening. In those days it was a tender sapling. It is now a vigorous tree and if we wish to see its present condition, we have only to look around us and reflect on the succession of prize-winners whom you have seen pass before you and all of

* Excluding Estate Accounts.

whom are destined for an agricultural career in this country. This immediate and substantial development, we owe, ladies and gentlemen, to the wise and generous policy of H. E. the Governor, who is determined to support this most valuable institution. I remember some ten years ago, when I was at a luncheon of the Agricultural Society, I think in Colombo, hearing my friend Sir Cristoffel Obeyesekere in a moment of enthusiasm express the idea that a Governor who fostered agriculture was almost a special manifestation of the Deity; and I have heard it stated on other occasions that the Governor who befriended agriculturists is a reincarnation of the King Parakrama Bahu the Great. I am sure these enthusiastic comparisons only express feebly the warm feelings of the people, when they see this staple industry and the foundation of the country's future recognised in such a manner. I can recall I think a line in the Mahawansa where the historian says "when wise Kings rule rains fall at reasonable intervals." (Applause.) We might say in modern language that when wise Governors rule we might look forward to abundant agricultural developments. Ladies and gentlemen, we have seen this agricultural school taking shape and form in these few years and in my opinion it has become one of the most important institutions in the Colony. (Applause.) Now, I will say it is second to none. I will freely confess that it is more important than the Law College, where we hope to see His Excellency next week and where five hundred young men are struggling to get a footing in the precarious profession of the law. Indeed I do sincerely trust that some of those young men who like my friend Mr. H. L. De Mel are going to begin their career by practising as proctors, will follow his example and go to the soil and become active landed proprietors. (Applause.) Indeed there seems a very close connection in this country between the bar and agriculture. Sometimes when I am sitting on the Supreme Court Bench listening to a complicated case, I realise that next to me is the Hon. Mr. de Sampayo an ex-president of the Low-Country Products Association, and that before me, two former Chairmen, Mr. Allan Drieberg and Mr. Sàmarawickreme are arguing the case. I look confidently forward to the day when the ambition of the country will not be so much, to figure at the Bar, where I know there is plenty of room at the top, but where many must fail in attempting to climb to the heights, but rather to have an agricultural career in this most splendid of all agricultural countries, which Providence seems to have specially marked out, not only as one of the most beautiful, but one of the most fertile countries of the earth, and in which life affords the full manifestation of the characteristics as could be found in the realm in which this school has been founded. I look round here upon this school, upon the new buildings of somewhat bare exterior but I know that in a few years these bare slopes and walks will be adorned with that beautiful vegetation, which has made Peradeniya famous throughout the world. I remember five years ago when I attended at the opening of the school I expressed the belief that these branching avenues of trees and lovely shrubs and flowers gave one the feeling as one walked under them of being in a great cathedral or among the great architecture of a University City. I have but one regret to which I must confess, namely, that the University has been situated in Colombo. I see that recently a desire has been expressed that some day there may be a National University. At present by the force of circumstances our University College is in Colombo and as Dr. de Silva has very wisely said our business now is to pull together and make it a success, and we will and we shall, I am sure, with the support of the new Principal who is now on his way out. But if the day should ever come when in the fulness of time, the University College in Colombo may be transformed into a University in these lovely surroundings where we can have University buildings grouped in the neighbourhood and hostels in the form of Colleges, then indeed, there will be an institution in surroundings

capable of arousing in the breasts of its present and past members, those feelings of ardent affection which we feel for the University of Cambridge and among others, Mr. Denham—who has gone away but who I am sure will return to us, (applause)—can feel for the University of Oxford—where development may come from within. And I am quite sure that in the College now securely founded on this spot, we are having a centre of one of the most potent and beneficent influences which exist in this Colony. (Loud applause.)

THE HON. MR. H. L. De MEL'S SPEECH.

The Hon. Mr. H. L. De Mel said that it was his privilege to be associated with Sir Anton Bertram in February 1916 at Peradeniya to bid Godspeed to the School of Tropical Agriculture. The School was started amid the din and bustle of the great war. The Director of Agriculture in asking him to speak on this occasion requested that reference should be made to the work of the past students of the Agricultural School employed by him and the members of the Low-Country Products Association. They all knew that since the inception of the School, H. E. The Governor had in and out of season preached to all of them the necessity of developing the backbone of Ceylon, viz., agriculture. They had in Mr. Stockdale a Director of Agriculture whose sympathies had not only been extended to proprietary planters and capitalists but also to the rural population. The village headmen were also not neglected in the school in that they were given good instruction which helped them to impart it to their less fortunate brethren in the villages. The speaker then paid a high tribute to certain old boys of the School who were doing good work. And he was proud to say that the members of the L. C. P. A. employed no less than nineteen old boys to-day. In this connection he said that he would like to see better brains and better talents devoted to agriculture than at present. There is a great future for the agriculturist in Ceylon if only he worked with a will and understanding. It was no good standing on one's dignity and those who did so should be arrested for having no visible means of support. This had been the weakness of his countrymen. Here the speaker quoted "Subhasitaya" where the author compared the students to the winds that carried the fragrance of education to the four corners of the earth.

HON MR. A. C. G. WIJEYEKOON.

The Hon. Mr. A. C. G. Wijeyekoon proposed a vote of thanks to His Excellency the Governor and Lady Manning. He said that a very pleasing duty had been allotted to him and that was to propose a vote of thanks to His Excellency the Governor and Lady Manning. Ever since the Governor set foot in the island he had taken a special interest in agriculture, and thereby he had struck the right note in the right direction. He had often heard it said that the Ceylonese youth had not taken to agriculture. There was a great deal of truth in it. And the reason given was that the prospects in that line were not at all bright. But after the important announcement made by H. E. the Governor that afternoon he felt sure that out of five hundred Law students at least 250 would enter the agricultural School. For the short time that Her Excellency had been in the island, she had taken great interest in education. The successful appeal she had made on behalf of the Deaf and Dumb School and her interest in the hospital at Gampaha which will bear her name would always be remembered by the people of the island. As had been pointed out by the previous speakers, and specially by Mr. De Mel, scientific education must go hand in hand with agriculture. With H. E. the Governor taking a special interest in agriculture, and Her Excellency taking an interest in education, they had no doubt that they would make very great progress in those two directions.

CEYLON AGRICULTURE.

BOARD OF AGRICULTURE.

Minutes of the Meeting of the Board of Agriculture held at the Council Chamber, Colombo, at 2 p.m. on Wednesday, August 24th, 1921.

His Excellency the Governor presided.

Present :—The Hon. the Controller of Revenue ; the Director of Agriculture ; the Hon. Dr. H. M. Fernando ; the Hon. Mr. O. C. Tillekeratne ; Messrs. W. A. de Silva and J. B. Coles ; the Chairman, Low-country Products Association ; Messrs. A. J. Austin Dickson, D. S. Cameron, H. D. Garrick, A. W. Beven, Graham Panditesekera, J. P. Blackmore, G. Bruce-Foote, N. G. Campbell, J. W. Oldfield, Thomas A. de Mel, C. E. A. Dias ; the Hon. Mr. James Peiries ; Lieut.-Col. T. G. Jayawardene ; the Agricultural Chemist ; the Assistant Entomologist ; Mudaliyar V. M. Muttukumaru ; Gate Mudaliyars C. H. A. Samarakkody and L. A. Dassanayake : Mudaliyars Edmund Peiris and G. A. Gunatillake ; Messrs. T. Walloopillai, A. A. Wickramasinghe, C. W. Bibile, Ratemahatmaya ; Messrs. K. V. Markandan, P. B. Nugawela, Ratemahatmaya ; Messrs. R. A. Senior-White, A. Sabapathy, S. Muttutamby : Divisional Agricultural Officer, Central ; Divisional Agricultural Officer, Southern ; Divisional Agricultural Officer, Northern ; the Economic Botanist ; Mr. F. Burnett ; Mr. N. Wickramaratne (Secretary, Food Products Committee) ; and Mr. P. B. Herat (Secretary of the Board).

Visitors :—The Hon. Robert Trefusis, Mr. N. B. Keppitipola, and Mr. Stephen Silva.

2. The minutes of the inaugural meeting held on February 9th, 1921, were confirmed.

3. The rules of the Board of Agriculture, as amended by the Attorney-General, were discussed and adopted.

4. The Director of Agriculture read a report on the work of the Board since its inauguration in February, 1921.

5. A paper on cotton soils in the Northern Province was taken as read, as printed copies had been sent to all members. Mr. N. Marshall detailed his observations on the black cotton soils in the Mannar District.

6. The Hon. Dr. H. M. Fernando was to move that:—

"In view of the fact that Government has abandoned the policy of increasing food production in this country by means of legislation, to consider whether it is desirable that, in the alienation of Crown lands for agricultural purposes in the future, provision should be made that a definite proportion of each land so alienated be devoted entirely to the growing of food products."

The Director of Agriculture suggested a postponement, as the motion had been submitted to the Low-country Products Association and the Planters' Association for their consideration. Dr. Fernando agreed.

7. Mr. A. W. Beven moved :—

"To discuss the results of Mudaliyar Rajapakse's experiment of returning to the soil the products of a field of coconuts to determine whether the productivities can be maintained so as to get an expression of opinion on the experiment from the Scientific Staff of the Agricultural Department."

It was agreed that the Director of Agriculture should write to Mudaliyar Rajapakse explaining the feeling of the Board that he should continue the experiments for a further period of two years, and that control areas should be established.

8. The Hon. Mr. H. L. De Mel moved :—

"That copies of the Tropical Agriculturist be sent free of cost to Ceylon students now studying scientific agriculture in England."

Mr. T. A. de Mel in seconding suggested that copies be sent free to Ceylon students studying agriculture in India too. Mr. Beven suggested free issues to Ceylonese employed in the Gold Coast. It was, however, agreed to accept the motion, and to grant to agricultural students in India the same concession of buying the magazine at half rates as had been allowed to agricultural students in Ceylon.

9. Mr. G. Bruce-Foote moved a discussion on "laws and regulations in force in Ceylon in respect of plant pests and diseases," and asked why Fomes, Ustilina, and Poria were not declared "pests."

Mr. W. A. de Silva suggested that the matter be referred in the first instance to the Estates Products Committee for consideration.

The Director of Agriculture replied giving details of the functions of Plant Pests Boards, and agreed that consideration of Fomes, Ustulina, or Poria as pests should be referred to the Estates Products Committee.

10. Mr. H. D. Garrick moved :—

"That this Board desires to endorse the Report of the Committee on the Economic Resources of the Colony in so far as it affects agriculture, and to emphasize the necessity of making full provision for the necessary staff and laboratories as early as funds permit."

Mr. J. W. Oldfield seconded.

His Excellency declared that it was the desire of Government to improve the Agricultural Department, and that every endeavour would be made to strengthen the Department as funds became available.

The meeting terminated at 3 p.m.

P. B. HERAT,
Secretary, Board of Agriculture.

ESTATE PRODUCTS COMMITTEE.

Minutes of the fourth meeting of the Estate Products Committee of the Board of Agriculture held at the Experiment Station, Peradeniya, at 2-30 p m. on Thursday, September 9, 1921.

Present :—The Government Botanist and Mycologist (in the chair), the Government Agricultural Chemist, the Government Entomologist, the Assistant Botanist and Mycologist, the Assistant Entomologist, the Government

Agent, C.P., Messrs. H. D. Garrick, A. J. Austin Dickson, W. Coombe, John Horsfall, George Brown, N. G. Campbell, J. W. Oldfield, J. P. Blackmore, C. E. A. Dias, N. D. S. Silva, G. Pandittasekera, A. W. Beven, M. L. Wilkins, Dr. C. A. Hewawitarne, Gate Mudaliyar A. E. Rajapakse and Mr. T. H. Holland (Secretary).

As visitors Messrs. E. C. Villiers, E. G. Cantrell, J. E. P. Rajapakse, C. H. Gadd and T. B. Ranaraja.

Mr. T. Petch read a letter from the Director of Agriculture regretting his inability to be present owing to a meeting of the Legislative Council.

Mr. N. G. Campbell proposed Mr. T. Petch as Chairman, Mr. H. D. Garrick seconded, and Mr. Petch took the Chair.

Letters and telegrams regretting inability to attend were read from the Hon'ble Mr. James Peiries, Hon'ble Mr. H. L. De Mel, Messrs. J. B. Coles, F. R. Dakeyne, G. B. Foote, D. S. Cameron, L. H. S. Peiris, W. P. Matthew, Lt.-Col. L. Bayly, Lt.-Col. T. G. Jayawardene and the Hon'ble the Controller of Revenue.

Before proceeding to the business on the Agenda the Chairman referred to two smoked rubber sheets which had been left for examination by Mr. C. E. A. Dias at the last meeting. Both sheets had been exposed to the air from July 8th. On August 3rd the sheet which had been coagulated with acetic acid became very mouldy. The mould was principally on the upper exposed surface. The sheet which had been coagulated with a German powder known as "Kill mould" was quite free from mould.

In reply to a question Mr C. E. A. Dias stated that about 1/3 of the powder had been used for each sheet. The cost was about 3 cents per sheet against 1 cent per sheet for acetic acid. The firm which sold this powder had stated that they would be able in the future to supply it at the same rate as acetic acid.

Mr. Dias promised to send specimens of the powder for examination. The Chairman remarked that it was possible to stop the action of fungi with certain preparations but their effect on the rubber was uncertain.

The Agenda was then proceeded with.

Item 1. Progress Report of Experiment Station, Peradeniya.

This was briefly commented on by the Chairman.

Referring to tea Mr. Neill Campbell asked if Shot-hole Borer was generally speaking on the increase in the Island.

Mr. Jepson replied that the correspondence with estates on the subject was very much less than formerly.

Mr. Austin Dickson thought that the general opinion was that it was on the increase; it was certainly spreading to higher elevations.

Mr. C. E. A. Dias asked if it would not be possible to write to all proclaimed estates and inquire whether Shot-hole borer was on the increase or not.

The Chairman promised to consider whether it would be possible to obtain this information from estates.

Mr. Neill Campbell inquired if New Zealand Flax did well at Peradeniya.

The Chairman replied that the flax was not looking well. He did not think it was cultivated in New Zealand.

Messrs. John Horsfall and E. C. Villiers stated that considerable areas were cultivated in New Zealand.

Agenda Item 2. Consideration of the Desirability of Declaring Fomes, Ustulina and Poria under the Diseases and Pests Regulations.

The Chairman remarked that this matter had been brought up at the full meeting of the Board by Mr. Bruce Foote in Colombo. At that meeting Mr. W. A. de Silva had suggested first referring the matter to the Estate Products Committee.

Mr. Bruce Foote was unfortunately not present. These diseases, the Chairman continued, were domestic diseases, they grow mainly on dead wood. If clean clearing were carried out and all dead wood removed the incidence of the diseases was unlikely. It was the duty of estates to attend to this and it was doubtful if the cost of the proclamation of the diseases and the necessary inspection would be worth the result.

Major J. W. Oldfield said that estates which were surrounded by small rubber holdings in which no precautions were taken ran considerable risk of infection. He asked if the matter could not be referred to the Planters' Association for their opinion.

The Chairman agreed that this was probably the best course. He pointed out that under the Plant Pests Ordinance when a pest was proclaimed it was left to the local Plant Pest Board to decide whether the Ordinance came into operation or not.

Mr. J. P. Blackmore asked if it will not be as well to make it compulsory for Plant Pests Boards to meet at least annually.

The Chairman replied that Plant Pests Boards were under the Government Agents or Assistant Government Agents.

The meeting finally agreed to refer the matter to the Planters' Association and the Low Country Products Association for their consideration.

Agenda Item 3. The Coconut Caterpillar at Batticaloa and Consideration of Declaring this Pest under the Diseases and Pests Regulations.

The Chairman stated that the Government Agent, Eastern Province, and the Plant Pests Board at Batticaloa were strongly of the opinion that this pest should be proclaimed.

Dr. J. C. Hutson, Government Entomologist, who had just returned from the Batticaloa district stated that the Local Plant Pests Board were anxious that the Pest should be proclaimed and were willing to undertake the work themselves. The best method was to burn fires at night to attract the moths or use regular light traps for the purpose.

Acetylene lamps were excellent but expensive. Ordinary cart lamps were quite effective. If the pest was declared it was proposed to make light traps or fires compulsory for 2 hours after dark. If this was kept up for 10 weeks or so the pest would probably be controlled for the time being. The Batticaloa Plant Pests Board were of the opinion that if this Pest were declared something might also be done against coconut beetles.

The Chairman pointed out that no other district would be affected by the regulations, unless desired.

The motion that the coconut caterpillar be declared a pest was put to the meeting and carried. The following regulations were approved of:—

"That fires should be burnt for two hours after dark for at least 10 weeks after the appearance of the pest."

Agenda Item 4. Disinfection of Imported Tea Seed.

A report on this subject had been circulated to members.

The Chairman stated that disinfection had been started in 1910 when there was a large import of tea seed from India and when Blister Blight, *Exobasidium vexans*, was prevalent in that country. In 1909 the diseases had appeared in the Darjeeling district. It was thought that it had been conveyed thither by seed.

In South Africa when the object had been to keep out fusarium it was found that this fungus survived the treatment. The method might be altered but the Indian Mycologists asserted that there was no known method of disinfecting the inside coat of tea seed without destroying the seed.

Mr. M. L. Wilkins inquired if immersion would be better.

The Chairman replied that it was not so good.

Mr. W. Coombe enquired if Blister Blight had been found on imported tea seed.

The Chairman replied that this was not possible as the Blister Blight fructification appeared on the green outer coat which shrivelled up before the seed is received. The report showed that in India a few spores had survived the journey by post though it was not clear exactly how long the spores had lived.

The tendency in other countries, particularly in America, was to stop the import of many seeds and plants in order to prevent the introduction of insect and fungoid pests.

The suggestion was that all imports of tea seed into Ceylon should be prohibited.

Mr. M. L. Wilkins said that this seemed the only practical way of dealing with the question. He asked if Blister Blight was a very serious disease. The Chairman replied that it was reckoned to be the worst disease in India.

Mr. H. D. Garrick remarked that the report said that the disease was only had in cold districts and enquired if the districts in Ceylon into which seed was allowed to be imported could not be limited.

Mr. Petch replied that in 1910 the suggestion had been made that tea seed should only be imported from districts in India for which the India Tea Association would give a guarantee that no blister blight existed within 10 miles. No tea seed however had ever been imported on such a certificate.

Mr. W. Coombe suggested that if the disease only flourished in cold climates the spores might be destroyed by heating.

The Chairman replied that the fungus survived, though it did not flourish, at Pusa, which has a hot climate.

Mr. Coombe suggested that more information be obtained from India on the subject.

The Chairman remarked that the elimination of the affected areas in India would cut out some of the best tea-seed-producing districts.

Mr. Garrick was of opinion that the barring of import from certain districts in India would not be reliable. A great deal of the seed now imported did not really come from the district it was said to come from. He suggested informing the Indian Tea Association that Ceylon proposed prohibiting the import of all India tea seed.

Mr. M. L. Wilkins was in favour of stopping all imports of Indian tea seed.

Mr. Garrick suggested referring the matter to the Planters' Association and bringing it up again at the next meeting of the Estate Products Committee.

This was agreed to.

Agenda Item 5. The feasibility of presenting results of Manurial Experiments in future in graph form instead of by figures as at present.

Mr. George Brown urged the adoption of the graph form of presenting results of manurial experiments. Nearly all figures he said were nowadays expressed in graph form, it was easy to see results at a glance. Mr. Brown submitted a rough form giving a suggested method of publishing the results of tea manurial experiments. He suggested that bimonthly graphs of these experiments would be welcome.

Mudaliyar Rajapakse did not agree with the graph method and wished figures to be continued.

Some other members thought that even if graphs were introduced the figures should be also published. Discussion followed.

Mr. M. Kelway Bamber agreed with the graph method but thought that too many lines should not be shown on one sheet. He thought that the figures were required in addition.

The Chairman promised to arrange for graphs to be published annually.

Agenda Item 6. The Effect of Manures on (1) Quality of Tea (2) Tea Blights.

Mr. George Brown in introducing this question dwelt on the desirability of more knowledge of the influence of manures on quality of tea.

This information was unobtainable at Peradeniya as the green tea from all the plots was sold and manufactured together. He suggested taking an estate at a high elevation which manufactured tea of a well-known high quality, for instance Goatfell estate, taking this tea as 100% standard, taking analyses of these teas and comparing them with analyses of teas grown under other conditions.

The Chairman said that the Indian Tea Association had been investigating this question for 7 years and had obtained no conclusive results. He pointed out that at Peradeniya it would be impossible to get a good flavour in any case and thought that the question was bound up in the need for a tea experiment station, with factory attached, in a good tea growing district. He thought that analyses and flavour had no connection. Mr. M. Kelway Bamber pointed out that the flavour obtained at Goatfell estate was excellent during part of the year while during the rush season it fell off considerably.

He thought that good flavour was probably due to slower growth with more time for the essential oils to develop. Rather than analysis he advocated sending teas grown under different conditions to Brokers for

report. Experiments of this kind had been carried out on certain estates.

Mr. Brown asked if sufficient machinery could not be installed at Peradeniya to deal with the tea from the experimental plots.

Mr. Bamber said that a model factory had at one time been suggested but that the money had not been forthcoming.

The Chairman thought that if any money was to be expended in this direction it would be better to go to a higher elevation.

After some discussion Mr. Bamber agreed to compare analyses of upcountry teas with tea from experimental plots at Peradeniya.

With regard to the second portion of Mr. George Brown's inquiry the Chairman stated that as soon as the enquiry had been received a survey of the tea plots under manurial experiment by Mycological and Entomological assistants had been commenced.

This would take a considerable time. A report would be submitted at the next meeting.

Mr. W. Coombe made an enquiry with regard to the manurial experiments at Sarnia in connection with Shot-hole Borer.

Mr. Jepson replied that the experiments were still in progress and he hoped to be able to supply some information after his next visit.

Referring again to the quality of tea Mr. Bamber remarked that one point he had omitted to mention was that a Visiting Agent had said that he had found that soils containing much lower oxide of iron invariably produced tea of good quality. He would like to see more work done on this point.

Agenda Item 7. The improvement or deterioration of soils under rubber.

Mr. M. L. Wilkins in introducing this subject said that he only intended it as a general question. His own opinion was that the majority of soils had improved vastly under rubber.

Mr. M. Kelway Bamber said that it was a very difficult question to answer. By tapping rubber very little was taken out of the soil. The tree of course took nourishment from the soil for its own growth but this was returned in the leaves.

Mr. J. P. Blackmore enquired if rubber made the soil more acid. He instanced the frequency of moss under rubber.

Mr. Bamber replied that though many Ceylon rubber soils were acid the probability was that rubber did not have this effect.

Mr. M. L. Wilkins suggested taking fresh analyses of the soils in the rubber plots at Peradeniya and comparing them with old analyses.

Mr. Bamber promised to do this.

Agenda Item 8. The Need of more Experimental Plots with New Products.

Mr. M. L. Wilkins dealt on the need for more information as to yields, diseases etc., both of new products and products already cultivated. He considered an area of at least ½ acre was needed for each product. He left the choice of new products to the Department of Agriculture.

Kitul and other plants for producing power alcohol were suggested.

Mr. J. P. Blackmore enquired what progress had been made with grafting rubber.

The Chairman replied that results so far had not been very successful. The Rubber Research Committee were issuing a circular on the subject.

Agenda Item 9. The Pruning and Disposal of Prunings of the Tea Manurial Plots on the Experiment Station, Peradeniya.

Some of the members visited the tea plots at the conclusion of the other business on the agenda.

The general opinion was that it would be necessary to prune each bush on its merits.

T. H. HOLLAND,

Secretary, Estate Products Committee.

FOOD PRODUCTS COMMITTEE.

Minutes of a Meeting of the Food Products Committee of the Board of Agriculture, held at the Legislative Council Chamber at 11-30 a.m. on August 24, 1921.

Present:—The Hon. Mr. F. A. Stockdale, Director of Agriculture (*Chairman*); the Hon. Mr. O. C. Tillekeratne; the Hon. Mr. H. L. De Mel, C.B.E.; the Hon. Mr. T. B. L. Moonemalle; the Divisional Agricultural Officer, Southern Division; the Divisional Agricultural Officer, Central Division; the Divisional Agricultural Officer, Northern Division; the Economic Botanist; Mr. C. Drieberg; Mr. W. A. de Silva; Mr. A. Sabapathy; Mr. P. B. Nugawela, Ratemahatmaya and Diyawadana Nilame; Gate Mudaliyar C. H. A. Samarakkody; Gate Mudaliyar L. A. Dassanayake; Mudaliyar V. M, Muttukumaru; Mudaliyar G. A. Gunatillake; Mudaliyar Edmund Peiris; Mr. C. W. Bibile, Ratemahatmaya; Mr. S. Muttutamby. Adigar,; Mr. R. Senior-White; Mr. E. C. Villiers; Mr. T. Walloopillai; Mr. A. A. Wickramasinghe; Mr. K. V. Markandan; Mr. G. Panditesekera; and Mr. N. Wickramaratne (*Secretary*).

Visitors:—Mr. H. D. Garrick, Mr. L. H. S. Peiris, Mr. T. B. Keppitipola Basnayaka Nilame, and Mr. R. Dharmalingam.

Minutes of the meeting held on June 20 last were confirmed.

The Chairman announced that Gate Mudaliyar A. E. Rajapakse had been nominated by His Excellency the Governor as a member of the Committee in place of Mr. A. W. Beven resigned, and Mudaliyar E. F. Edirisinha in place of Mr. C. C. Wilson resigned.

Agenda Item 2.

Mr. A. Sabapathy moved that "Considering the fact that Jaffna is an important agricultural district with very large number of cattle required for agricultural purposes in general and for food production in particular, and considering also that pasture lands are not adequate for the breeding and feeding of cattle in the peninsula, and the price of straw having become prohibitive, Government be approached with the request to reduce the railway rate on straw to facilitate its introduction into Jaffna from stations beyond the peninsula."

Mudaliyar V. M. Muttukumaru seconded the motion.

Mr. W. A. de Silva wished to know whether the mover would be prepared to amend the motion, making it general, without limiting it to Jaffna, and asking that the rate be reduced to the sixth class.

Mudaliyar Samarakkody agreed with him, and seconded the amendment.

Mr. Sabapathy had no objection to the amendment.

The Chairman summed up the position, and said that he would submit the matter to Government.

The following amended motion was carried unanimously :—"Considering the fact that a large number of cattle are required for agricultural purposes in general and for food production in particular, considering also that pasture lands are not adequate for providing food for cattle, and the price of straw having become prohibitive in most parts of the Island, the Government be approached with a request to reduce the railway rate on straw to the sixth class rate."

Agenda Item 3.

Mr. A. Muttutamby moved a discussion "On the uselessness of distributing leaflets, etc., and the necessity of establishing demonstration plots."

The Hon. Mr. Tillekeratne seconded the motion *pro formâ*.

Mr. C. Drieberg agreed with the mover that demonstration plots were most desirable, but entirely disagreed with him with regard to the leaflets, which were, he said, very useful.

Mudaliyar Samarakkody supported Mr. Drieberg.

Mr. Nugawela said that leaflets were useful, and demonstration plots were also desirable.

Mr. Muttutamby explained that his observations referred to the more backward districts, and his object was only to raise a discussion on the subject.

The Chairman offered remarks, after which the Committee agreed to the necessity of increasing the number of demonstration plots.

Agenda Item 4.

The Chairman led a discussion on paddy growing and vegetable garden competition, and said that the matter was brought before the Committee for their views.

The Divisional Agricultural Officer, Southern Division, gave details of the scheme in the Southern Division.

Mr. W. A. de Silva, the Hon. Mr. H. L. de Mel, and Mr. A. A. Wickramasinghe offered remarks.

Agenda Item 5.

The Hon. Mr. H. L. De Mel moved—"That it is desirable that suitable grasses should be introduced for the drier districts with the object of providing cattle with fodder."

Mr. Drieberg seconded the motion.

The Chairman offered remarks, and undertook to discuss the matter with the officers of the Department and see what experiments should be carried out.

Agenda Item 6.

The Hon. Mr. H. L. De Mel moved—"That it is desirable to impress on those living in and around the principal towns the necessity of rearing poultry."

Mr. Villiers seconded the motion.

Dr. W. A. de Silva objected to the motion.

The Hon. Mr. De Mel replied.

The motion was put to the meeting and was carried.

The meeting adjourned *sine die*.

N. WICKRAMARATNE,
Secretary, Food Products Committee.

FOOD PRODUCTION COMMITTEES.

TRINCOMALEE.

Minutes of a meeting of the Trincomalee District Food Production Committee held at the Kachcheri on the 13th of August, 1921.

Members present:—Messrs. H. M. M. Moore, Assistant Government Agent, in the chair; W. G. Vallipuram, Office Assistant, Secretary; N. Marshall, Divisional Agricultural Officer, N. D.; D. W. Abeyagunasekera, sub-divisional Forest Officer; J. V. Aiyampillai, Kachcheri Mudaliyar and Town Vanniah; K. Vairamuttu, Vanniah, Koddiyar; A. Canagasingam, Vanniah, Tamblegam; and A. V. Chelvanayagam, Agricultural Instructor.

Read and confirmed minutes of the last meeting held on 20th January, 1921.

The following resolutions were unanimously passed:—

1. That the competition cultivation of paddy plots should be held this year.

(a) That paddy should be cultivated in Koddiyar and in Kaddukulam pattu East during the Munmari season and that intending competitors should send in their applications to the Secretary, Food Production Committee, through their Chief Headmen on or before 1st October, 1921.

(b) That paddy should be cultivated during Pinmari season in Tamblegam and Kaddukulam pattu West and that intending competitors should send in their applications to the Secretary, Food Production Committee, through their Chief Headman on or before March, 1922.

(c) That vegetable should be cultivated in Town and Gravets, and that intending applicants should send in their applications to the Secretary, Food Production Committee, through their Chief Headman on or before 1st January, 1922.

2. That a sub-committee be appointed consisting of the Assistant Government Agent, Chairman; the Office Assistant, Secretary; the Divisional Agricultural Officer, N.D.; the Town Vanniah, the Agricultural Instructor and Mr. S. Tiyagarajah to frame rules for the Competition Plots.

3. (a) That the following gentlemen be appointed as judges of the competition plots in Koddiyar, Tamblegam, Kaddukulam East and West:

The Assistant Government Agent,
The Divisional Agricultural Officer and
Mr. E. Sivagurunather

(b) That the Assistant Government Agent, the Divisional Agricultural Officer and Mr. Sangari Murugesu be appointed as judges of the garden cultivation in Town and Gravets.

4. That application be made to the Director of Agriculture for Rs. 600 on account of prizes for competition plots and Agricultural Show of 1922.

5. That an Agricultural Show be held at Trincomalee in the last week of April 1922.

6. That the following gentlemen be appointed to form a sub-committee to frame rules and to make all necessary arrangements for the Show :—

The Assistant Government Agent,
The Office Assistant
The Divisional Irrigation Engineer,
The Divisional Agricultural Officer,
The Town Vanniah,
The Koddiyar Vanniah,
The Vanniah, Tamblegam,
The Udaiyar, Kaddu East,
The Korala, Kaddu West,
The Agricultural Instructor
The Sub-divisional Forest Officer and
Mr. S. Tiyagarajah, and that five members do form a quorum.

7. Tabled letter No. 4258 of 22'7 21 *re* paddy cultivation competition.

8. That the Udaiyar, Kaddu East be elected as an Official Member of the Committee.

MATARA.

Proceedings of a meeting of the Food Production Committee held at the Matara Kachcheri, on 19th August, 1921.

Present :—Mr. J. D. Brown in the chair and the following gentlemen :—

Messrs. G. Auchinleck, G. Altendorff, Barnes Samaraweera, Mudaliyars W. A. Ameresekera, P. F. de Livera, H. W. Wickremeratne, W. A. Perera, D. L. Wirasinhe, F. Wickremeratne, Mr. J. E. Wijesinhe and Mr. M. J. A. Karunanayake.

1. Read and confirmed the minutes of the meeting held on 15th June, 1921.

2. Resolved that in the event of Mr. Auchinleck leaving the Island in September next that his successor be asked to deliver a lecture in October next on the improvement to coconut cultivation or on some other suitable subject.

3. Read out results of transplanting competitions in Gangaboda Pattu, Weligam Korale and Wellaboda Pattu.

4. Resolved that a cycle of Agricultural and Industrial Shows be arranged as follows :—

1.	Weligam Korale	1922
2.	Four Gravets (changeable to District Show) ...	1923
3.	Wellaboda Pattu and Gangaboda Pattu ...	1924
4.	Kandaboda Pattu	1925

5. Resolved that organisation of Village Shows in Morawak Korale be deferred for the present. That instead of these, Market Shows be arranged if and when future developments of markets occurs.

6. Resolved that transplanting competitions be arranged as follows, and the Government grant be apportioned as indicated below :

1.	Weligam Korale Show	Rs. 150·00
2.	Wellaboda Pattu competitions	,, 150·00
3.	Kandaboda Pattu	,, 150·00
4.	Four Gravets	,, 150·00

7. Resolved that a sum of Rs. 150 be apportioned out of Huwandiram Funds for Morawak Korale Competitions if any are arranged.

8. Resolved to table Mr. Wijesinhe's Memorandum *re* Vel Vidane System at the next meeting.

Proceedings terminated with a vote of thanks to the Chair.

PROGRESS REPORT OF THE EXPERIMENT STATION, PERADENIYA.

From 1st July, 1921, to 31st August, 1921.

TEA.

Crop has been very poor. 1,899 lb. green leaf for July, and 2,360 lb. for August, a total of 4,259 lb. against 8,391 in May and June, and 12,872 lb. in July and August, 1920.

Shot-hole Borer is distinctly on the increase and the condition of some of the plots is poor.

The Dadaps in plots 144 and 149 were lopped after an interval of 4 months and yielded 6,018 and 6,086 lb. per acre respectively.

Vacancies in the newly planted dadaps in these plots have been supplied.

In the Hillside tea clearing supplying was completed in more favourable weather, all shade was lopped and the well grown bushes cut down to 18 in. The ½ acre tea clearing has been supplied with Light leaf Manipuri stumps from High Forest, Maturata. In this plot the rapid growth of *Gliricidia maculata* after lopping as compared with Dadap is most marked. The two will in future be lopped at the same time and comparative weights kept of the green material afforded.

All drains have been cleaned and some blasting and splitting of rocks to improve the drains has been carried out.

RUBBER.

Plots 14 and 15, under individual tree yield experiment has been ploughed and cross-ploughed.

90 trees have been thinned by elephant from the old rubber and Avenue rubber. All trees have been sawn up and carted away.

The cost of extracting by elephant, cutting up and carrying to the road has been approximately 35 cents per tree.

A row of large dadaps and a row of Castilloa rubber adjoining the Para rubber has been similarly dealt with.

In the new Avenue rubber an irregular mixture of old dadaps, Gliricidia maculata and Leucæna glauca have been removed by elephant.

The area between the rubber avenues will now be planted up with selected green manure plants. Vacancies in this areas of the Bandaratenne rubber have again been supplied.

In the latter area the green gram has been ploughed in. Of the green manures planted to keep down weeds Indigofera arrecta is one of the most successful.

All dead branches have been removed.

CACAO.

All fungus pods and diseased immature pods were collected during 1st week in August. In spite of this in the course of a regular picking commenced on August 16th a considerable proportion of fungus pods were found. Monthly picking of diseased pods will be continued.

A number of large fallen dadaps have been removed by elephant.

The swarm of locusts present in the Cacao are now winged. They have defoliated dadaps, arecanuts, coconuts and one or two jungle trees. They have done no damage to Cacao or rubber though they have alighted in large numbers on these trees. They are now much more scattered. A watch is being kept for their descent for egg laying.

COCONUTS.

Another picking was taken in August resulting in 9,861 nuts against 8,452 and 6,636 in the two previous pickings.

The Bandaratenne coconut plot has been ploughed and drains cleaned.

Nuts have been sold @ Rs. 5/- per 100.

PADDY.

In the new paddy area all green manures have been ploughed in.

2 plots of Murungan paddy broadcasted for the Yala crop were harvested at the end of August. This appears to be a four months Paddy at Peradeniya. The growth suffered severely from lack of water and the yield was poor.

The Ellankallayan sown at the same time appears here to be a 5 to 6 months variety and has made better growth.

Both crops suffered from the newness of the plots. Paddy fly has been prevalent.

An experiment is in progress of tile-draining water-logged plots with half round tiles. The prices quoted for making tile pipes were prohibitive.

So far the method appears very successful. Cost of the work will be published later.

COFFEE.

Suckers—diebacks have been removed.

A new nursery has been made.

FIBRES.

The small areas of Mauritius and Sisal hemp in Plot 17 have now been dug out as plots have been established in the new Economic collection.

A plot of New Zealand Flax, Phormium Tenax, has also been planted.

TUBERS.

Another crop has been taken from the six varieties of Cassava imported from Mauritius. The yields of the three crops are given together.

	December 1918	December 1919 & Jan. 1920	August 1921	Average of three crops.
Smallings ...	28,672	10,103	12,576	17,117
Singapore ...	21,504	5,878	9,619	12,334
Manioc de Table ...	16,128	10,556	5,792	10,852
Cassava Beurreum ...	10,752	6,584	14,338	10,558
Butter stick ...	14,336	10,321	4,800	9,819
Trinidad ...	15,232	8,045	5,315	9,531

It will be seen that the yields have declined. This may be attributed in the 2nd crop to the poor steep land on which the crop was grown and in the third to the excessive drought.

An attempt has been made to sort out the numerous varieties of sweet potatos growing on the station. A few have been eliminated. 8 more varieties have been planted out on a field scale to obtain yields. 4 varieties of Ceylon yams have been divided and replanted.

FODDER GRASSES.

The planting of ½ acre of Paspalum Dilatatum has been completed. The grass is growing well. A few roots of Kakeyu grass, *Pennisetum Longistylum*, a grass very well spoken of in Australia, have been received from New South Wales. Most of the roots have sprouted. Some roots of elephant grass *Pennisetum prespereum* have also been received from the Royal Botanic Gardens.

CEREALS.

4 varieties of Indian corn recently received from United States, America, have been planted on a field scale.

LEGUMES.

3 varieties of cow peas recently received from Fiji have been planted out on a field scale.

6 more varieties have been received from United States, America. Cow peas do very well at Peradeniya if protected from snails in the early periods. If unprotected, snails may destroy the whole crop.

CAMPHOR.

Fresh attempts to improve outturn from the still previously in use have failed. Trial will now be made with a new type of still.

SUGAR-CANE.

A small area in plot 16 has been dug out. The remainder of the cane has all been "stripped." A disease identified as "Collar Rot" (Hendersonina Sacchari Butler) is fairly common. The only variety apparently free from the disease is "Sin Nombre." while Sealy's seedling and 55 P are the worst affected.

ECONOMIC COLLECTION.

Several additions have been made to this but great difficulty is being experienced in raising some of the plants. The area is wind-swept.

The plots not likely to be planted this year with their permanent products have mostly been utilized for obtaining yields of annual crops.

MISCELLANEOUS.

5 cwt. of Nitrate of Soda has been received free from the Chilean Nitrate Committee for experiments with minor Agricultural products.

Experiments are in progress with sweet potatos, Cow peas, Lima beans, and Hill paddy.

Considerable progress has been made with the new road round the Economic plots : 2 large culverts have been put in.

In plot 16 an area formerly under Manilla hemp which was destroyed by disease has been planted with plantains in order to see if any connection can be traced between the disease of the Manilla hemp and "Bunchy Top" of plantains now under investigation by the Assistant Botanist and Mycologist.

The oil grasses in plot 17 have been dug out and partly replanted in another area.

Croton oil trees have also been eradicated as the new plot is well established.

The season has been very favourable for weeding and a great improvement in this direction has been made.

Eradication of couch and Illuk still demands close attention.

Rainfall was 7·28 inches for July, and 14·65 for August.

T. H. HOLLAND,
Manager,
Experiment Station, Peradeniya.

SOILS AND MANURES.

COTTON SOILS IN THE MANNAR DISTRICT.

To the Members of the Board of Agriculture:

Mr. B. Horsburgh, when Government Agent, Northern Province, drew my attention to the existence of what appeared to be "black cotton soil" in the Mannar District. He secured four soil samples, and these were analysed by the Government Agricultural Chemist. Recently Mr. N. Marshall, Divisional Agricultural Officer, Northern Division, was detailed for an inspection of the area.

The reports of the Agricultural Chemist and of the Divisional Officer show that land to the extent of about 16 square miles suitable for cotton exists in the Mannar District, but that owing to sparseness of population, lack of communications and of large cattle there can be little hope of developing this area at present.

As, however, it appears desirable these investigations should be placed on record, the reports are submitted to the Board of Agriculture for their information.

F. A. STOCKDALE,

Peradeniya, July 26th, 1921. Director of Agriculture.

Report of the Government Agricultural Chemist on the Soils of Tunnukai in the Northern Province suitable for Cotton Cultivation.

Soils of Tunnukai.

I have the honour to report on the samples of above submitted for examination.

1. *Field at Tunnukai* is a gray, lumpy loam, with its soil particles fairly evenly distributed, and with very little colloidal clay. The mineral constituents are rich in lime and magnesia, with fair supplies of phosphoric acid and potash. The humus and nitrogen are poor.

2. *Kariyal on the Vellankulam.*—This is a black, lumpy, silty loam consisting mainly of fine silt. There is not much colloidal clay present. The soil is rich in lime and magnesia (richer than any of the other soils of the set). The potash is present in fair supply; the phosphoric acid is poor. The nitrogen and humus are poor. The reaction is alkaline.

3. *Yarkadu* is a gray, sandy loam, with soil particles fairly evenly distributed; there is little colloidal clay present. The lime and magnesia are present in good supply; the potash is present in fair supply; the phosphoric acid is poor. The nitrogen is present in better supply than the other soil of the set. The humus is poor.

4. *Kellamanthæ* is a red, silty loam consisting largely of silt, with practically no gravel. This soil has more colloidal clay than the others. The lime and magnesia are in good reserve causing the reaction to be alkaline (the second richest in the set); the potash is in good supply. The phosphoric acid is fair. The nitrogen and humus are poor.

The analyses of the soils are given below :—

Tunnukai "Cotton Soils," Northern Province.

Mechanical Composition.

	Field at Tunnukai. Per Cent.	Kariyal on the Vellankulam Road from Tunnukai. Per Cent.	Yarkadu at Tunnukai. Per Cent.	Kellamanthæ near the Tank Bund towards East. Per Cent.
Fine flocculent silt ...	28·00	60·00	25·00	52·00
Fine soil passing 90 mesh ...	21·00	8·00	19·00	20·00
Fine soil passing 60 mesh ...	17·00	8·00	18·00	12·00
Medium soil passing 30 mesh ...	21·00	14·00	25·00	12·00
Coarse sand and small stones ...	13·00	10·00	13·00	4·00
	100·00	100·00	100·00	100·00

Chemical Composition.

	Field at Tunnukai. Per Cent.	Kariyal on the Vellankulam Road from Tunnukai. Per Cent.	Yarkadu at Tunnukai. Per Cent.	Kellamanthæ near the Tank Bund towards East. Per Cent.
Moisture	2·900	8·400	2·400	4·100
Organic matter and combined water	2·100	7·600	4·200	5·500
Oxide of iron and Manganese ...	2·700	4·200	2·100	5·200
Oxide of alumina	2·645	7·528	2·295	7·248
Lime	0·720	1·380	0·760	0·900
Soda	0·408	0·440	0·480	0·420
Magnesia	0·374	0·374	0·260	0·432
Chlorine	0·021	0·022	0·009	0·010
Potash	0·068	0·054	0·054	0·126
Phosphoric acid	0·064	0·042	0·042	0·064
Sulphuric ani-hydride ...	Nil	Nil	Nil	Nil
Sand and silicates ...	88·000	69·600	87·400	76·000
	100·000	100·000	100·000	100·000
Containing nitrogen ...	0·073	0·073	0·134	0·084
Equal to ammonia ...	0·088	0·088	0·163	0·102
Lower oxide of iron ...	Trace	Trace	Trace	Trace
Acidity	Neutral	Alkaline	Neutral	Alkaline
Humus	Very poor	Very poor	Very poor	Very poor

Comparing above with the following analyses of soils from the cotton district of Madras, India, it will be seen that the Ceylon soils compare

favourably :—

Agricultural Ledger, 1898—No. 2—Dr. Leather.

Analyses of Black Cotton Soils of Madras Presidency, India.

	South Arcot District.		Madura District,
	Chidambaran Taluk. Per Cent.	Cuddalore Taluk. Per Cent.	Teramanyalam Taluk. Per Cent.
Insoluble silicates and sand ...	82·33	79·09	72·68
Iron	4·84	8·7	6·09
Alumina	5·85	10·60	8·39
Manganese	0·09	0·05	0·19
Lime	0·32	0·05	2·42
Magnesia	1·04	0·21	1·86
Potash } Soda }	0·98	0·10	0·16
Phosphoric acid	0·06	0·14	0·07
Sulphuric acid	Nil	Nil	Nil
Carbonic acid	0·06	0·09	2·00
Organic matter and combined water (difference)	4·43	3·34	6·14
	100·00	100·00	100·00
Nitrogen	0·017	0·008	0·019

The American cotton soils (*vide* subjoined list) are much richer than the Indian or Ceylon soils, especially in potash and phosphoric acid, but the lower yielding American cotton soils compare favourably with the Ceylon soils :—

Hilgard, page 497—Mississippi Soils.

Names	Production Per acre lb.	Physical Character	Potash Per Cent.	Lime Per Cent.	Magnesium Oxide Per Cent.	Phosphoric Acid Per Cent.	Humus Per Cent.
Black prairie soil -	400	Heavy adhesive dark coloured clay	0·333	1·367	0·363	0·104	1·25
Pale yellow ridge loam -	200	Pale yellow sandy loam	0·093	0·069	0·126	0·033	0·50
Pontotoc ridge soil -	350–400	"Mulatto" medium loam	0·374	0·281	0·234	0·082	1·00
Oak and pine upland loam	200	Medium loam	0·236	0·092	0·196	0·091	0·50
Brown table land soil -	400	Clay loam	0·630	0·270	0·450	0·210	0·79
Bluff or Loess soil -	400	Sandy loam	0·511	5·921	3·278	0·143	0·72
"Buckshot" soil -	800	Heavy calcareous clay soil	1·104	1·349	1·665	0·304	1·00
Shell Hammock soil -	300	Very sandy loam, deep	0·080	0·115	0·065	0·107	0·75

A. BRUCE,
for Government Agricultural Chemist.

October, 14, 1917.

Report of the Divisional Agricultural Officer, Northern Division, on Inspection of Black Cotton Soil in Tunnukai in Northern Province.

I have the honour to report that I visited the Tunnukai area from May 21 to May 25, during which period I inspected the black cotton soil area in that locality.

Position of Black Soil Area.—The black soil lies west of Tunnukai, 14½ miles west of Mankulam, and the area practically commences at the village of Tunnukai itself, and extends westwards towards Tagalamavil for a distance of approximately 4 miles, and the approximate north and south boundaries are Mattiraiyanakulam in the north and south, Murunkankulam in the south, a distance also of approximately 4 miles, making the area of black soil approximately 16 square miles.

Communication.—The roads in this district are poor ; in fact, there is only one road leading direct from Mankulam on the railway to Tunnukai, a distance of 14½ miles, and takes 4½ to 5 hours to traverse. The other road is from Velankulam, near the coast, to Tunnukai, a distance of 12½ miles. These roads are only cart tracks through the jungle, and are in poor condition, and are, I should think, in wet weather almost impassable, if much traffic proceeded along it.

Water Supply.—The water in this district is good. Good drinking water can be obtained from wells in this district. Average depths of wells from top to water level being about 10 to 15 feet. There are also five small tanks in this area, two of which are used for cultivation purposes, and the other three at present are unused, and have been left unattended to.

Rainfall.—The average rainfall is under 40 inches, and the chief rainfall is between October and December, with occasional showers in January and February. Rainfall from October to December is approximately 20 to 27 inches.

Labour.—This part of the country is very thinly populated. In the village of Tunnukai there are only 40 inhabitants, whose chief livelihood is the cultivation of paddy under tank irrigation. Any labour required for the cultivation of cotton would have to be introduced.

Cattle.—The cattle in this district are the small black cattle, similar to the cattle in the Jaffna District, and not at all suitable for pulling the heavy implements required for the proper cultivation of black cotton soil, and if cultivation of cotton was taken up, a stronger breed of cattle would have to be introduced, and other foods than merely paddy would have to be introduced.

Health of District.—The inhabitants inform me that the area is free from fever during the greater part of the year, but that during certain seasons, particularly from November to February, fever is often very prevalent.

General Description of Area.—The area from Tunnukai going westwards for the start is chiefly low jungle with large area of park land intermixed, and as you proceed south-west towards Kalvilan and Murunkankulam you come to high forest and lose the park land. Proceeding north and north-west you have first the same mixture of low jungle intermixed with areas of park land dotted over with small trees, and then as you reach Kandiyatevan-kulam you come to practically only scrubby jungle.

The Soils in the Area.—(1) The soil referred to in the Analyst's report (forwarded to me by your letter No. 480 of April 15) as *Yarkadu*, which merely means the clearing round the village, is more a gray than black soil, and is a sandy loam in texture, and is, I consider, of poor quality lacking in humus.

(2) The part called Field at Tunnukai in appearance is practically the same as the Yarkadu area, and this can be easily understood when it is pointed out that the two areas adjoin one another, the difference in the amount of nitrogen in the Yarkadu probably being accounted for by the fact that all the village cattle and goats are brought to this clearing every night to sleep there.

(3) The area called Kariyal, apparently from which the second sample of soil was taken, means black soil, on the Vellankulam road, and this is a length of about 4 miles straight westwards from Tunnukai, and it was rather difficult to locate this, but the soil at the area on the road just north of Kalvilankulam is a better soil than that nearer Tunnukai being of a better colour and texture. But the best black soil of all is down just round the area of the two Murunkankulams, this probably being because you are then getting away from the scrub jungle into high jungle.

(4) The fourth sample called Kellamanthæ, near the bund of the Tunnukai tank, is of a more reddish soil than the proper black cotton soil, and in Madras would probably be used either for growing garden crops or else Cambodia cotton, as this area is irrigable. This is the richest and best soil of the four, except for nitrogen, in which the Yarkadu leads, probably for the reason I have previously mentioned.

General Remarks.—I consider that this area would be quite suitable for growing cotton—the soil is typical black cotton soil, and has a depth varying from 10 to 15 feet—and the analysis of the soils compares very favourably with the black cotton soils of Madras. Also the rainfall is sufficient for the growth of a cotton crop, and apparently rain is not likely to fall when the crop is in flower and spoil the bolls. The objections to growing cotton there are :—

(1) It is an area right in the middle of a jungle 14½ miles from the railway.

(2) Communications are poor.

(3) The labour force would have to be introduced.

(4) The cattle are not strong enough to work the implements necessary. Although if the park land was cleared and stumps taken out, it would be excellent land for tractor work, if cultivation was done on a large scale, and provided the cultivation was not left until too wet as a tractor would be unable to move in the black soil once it becomes soaked.

There is a great danger of damage being done by wild animals, especially elephants, for the jungle round about is full of deer, wild pig, semi-wild buffalos, and elephants, and I consider it extremely probable that a lot of damage would be done by these animals, unless practically the whole area was cleared and well fenced, and an efficient number of watchers kept.

Also, I consider that there is every possibility of the crop being destroyed by insect pests, being a cultivated area isolated in the middle of a large area of forest.

General Conclusion.—My opinion is that the soil and climatic conditions are perfectly suitable for cotton growing. But that the position (*i.e.*, distance from the railway and from a market), lack of labour and cattle, and danger of insect pests, and damage by wild animals, etc., would make it an extremely

risky speculation for any one to take up. Also, the area being approximately only 10,000 acres, and if ordinary methods of cultivation were used, 50 per cent. (*i.e.*, 5,000 acres), of this I expect would be under cotton and 50 per cent. under other crops (*i.e.*, Cumbu: *Pennisetum Typhoidum*, or Periamanjal Cholam, or some other grain crop). Using a two-year rotation, from this we could expect a return of 300—400 lb. cotton per acre (including the seeds), which would give approximately 1 500,000 lb., or 3,000 candies (candy = 500 lb.), at 20 cents a lb. = Rs. 100 per candy. Therefore, value of total estimated output for whole area = Rs. 300,000, or Rs. 60 from each acre under cotton. The actual cost of keeping the cattle necessary and actual cultivation expenses that would be incurred I have no means of estimating, but the straw from the grain crop grown, and the cotton seed from the cotton crop if local gins were established, together with natural local grazing, would be sufficient to feed the cattle for the year. But in my opinion I consider it would be too great a risk for small cultivators to go and settle there for cotton cultivation in view of the small return likely and the large initial outlay and expense.

N. MARSHALL,
Divisional Agricultural Officer,
Northern Division.

Jaffna, June 9, 1921.

CHANGES IN MANURE DURING STORAGE.

However farmyard manure has been made, it starts with a mixture of excrement, urine, and litter, which become more or less consolidated and mixed together by the trampling of the animals. Other changes, however, intervene very rapidly, and these, in the main, are brought about by bacteria which, for convenience, may be divided into two groups, one acting on the cellulose and other carbon compounds of the straw that make up the bulk of the manure, and the other supplying the main fertilizing properties of the dung.

Among the more important of the organisms dealing with nitrogenous material are those which attack the urea of the urine, and by adding to it the elements of water give rise to a readily dissociated free ammonia and carbonic acid, both gases, and therefore capable of escape into the atmosphere This change into ammonium carbonate is an extremely rapid one ; in the liquid draining from a yard of manure tank, little or no urea can be detected, so complete has been the change to ammonia. As long as the liquid containing the ammonium carbonate is protected from evaporation, no loss of nitrogen will result, but the more surface it exposes to the air, and the higher the temperature, the greater will be the amount of ammonia passing off in a gaseous condition. Thus thin films of urine on the floors, walls or even on the surface of loose straw easily lose nitrogen by the fermentation of the urea and subsequent volatilization of the ammonia. The smell of a stable arises in this way and is clear evidence of the escape of ammonia. As will be shown later, this volatilization of ammonia causes most of the loss of nitrogen that takes place in making dung.

The ammonium carbonate is itself subject to change and even to loss by other actions than evaporation ; there are always present in the manure heap bacteria, which can oxidise ammonia into nitrogen gas and water ; in consequence, dung, which is allowed to lie about loosely, is poorer in nitrogen from this cause, as well as through volatilization of ammonia. This process,

by which gaseous nitrogen is set free, is often called "denitrification," a term better restricted to the change whereby nitrates are reduced to nitrogen gas. The conditions favourable to this change have not been closely investigated. It is, however, certain that rapid oxidation, such as is brought about by a loose condition of the manure, or by turning it, will be accompanied by some destruction of ammonia. It is also favoured by the presence of soluble carbohydrate, i.e., easily oxidisable material and it is materially reduced if not suspended, as soon as these substances have been used up.

Another group of bacteria which are extremely abundant in fresh fæces are the so-called putrefactive bacteria which break down the proteins into simpler compounds, such as amino-acids, annides, and finally ammonia. Without discussing them individually their function is to convert the insoluble nitrogenous bodies of the straw (those of the fæces are more difficult to attack because they have already resisted the actions of the digestion) into soluble bodies akin to ammonia, and therefore more nearly available to the plant. Thus with a certain amount of loss of free nitrogen, the trend of the bacterial actions taking place in the fresh farmyard manure is to break down the complex soluble compounds of nitrogen to more and more simple ones, ammonia being the final form. At the same time there is always a reverse change going on; as the bacteria themselves multiply, they seize upon the active soluble forms of nitrogen and convert them into insoluble proteins in their body tissues. Which action is predominant, will depend on the stage which has been reached in the dung-making process, i.e., on the supply of carbohydrates, air, water, and other variable factors, but after the first rapid production of ammonium compounds the longer the dung is stored the more the ammonia returns to a protein form.

So far only the changes in the nitrogenous material of the excreta and the litter have been considered, since nitrogen is the chief fertilizing constituent of the manure, but the most characteristic change in dung-making is the destruction of the straw and its conversion into dark brown "humus," which in the end retains none of the structure of the original straw. There are a number of organisms to be found commonly in the air and dust which readily attack such carbohydrate material as straw affords, and in the presence of oxygen burn it up completely into carbon dioxide, water and inorganic ash.

A considerable proportion, amounting to one quarter or more of the dry matter of the original dung, is lost during the process of humification, by the conversion of carbohydrates into carbon dioxide, marsh gas, hydrogen and water. No changes going on during the making and storing of farmyard manure are, it will be seen, exceedingly complex; it is in the early stages that the bacterial actions are most rapid, and they fall chiefly upon the soluble nitrogenous compounds like urea. What the gardener calls "taking the fire" out of the manure means so reducing the free ammonia that the material is no longer injurious to a plant's roots, though it still remains rich in nitrogen and organic matter, capable of further decay. The "long" strawy dung begins to change to "short" or rotten manure, and this change may continue slowly for years, until all trace of structure is entirely gone and only a mass of brown pulp is left. Of course, as the manure gets older and shorter, it becomes richer in nitrogen; this apparent increase is, however, simply due to the loss of non-nitrogenous carbon compounds, so that the nitrogen, which does not waste, always bulks larger and larger in the residue.

One other change sometimes takes place when the manure is allowed to get loose and dry; instead of bacteria, fungi begin to develop very rapidly and the whole mass becomes permeated with mycelium. The masses of manure begin to look white and dusty, a condition which the practical man sometimes describes as "fire fanged." It is generally agreed that such manure is seriously deteriorated, but no analyses are available to prove this.

—Journal of Mysore Agric. Expt. Union, Vol. III, No. 1.

APICULTURE.

REPORT OF THE SECRETARY, CEYLON BEE-KEEPERS' ASSOCIATION.

The Ceylon Bee-keepers' Association was inaugurated at a general meeting held on 23rd August, 1918.

The Association started with 17 members:—1. Sir S. D. Bandaranaika, 2. Mr. A. P. Goonatilleke, 3. Mr. H. S. Stevens, 4. Mr. Claude Crozier, 5. Mr. J. P. Obeyesekere, 6. Mr. J. A. Victor Perera, 7. Mr. R. Smerdon, 8. Mr. Charles Andree, 9. Mr. George Crozier, 10. Mr. R. W. Cracklaw, 11. Mr. F. R. Dias, 12. Mr. S. W. Illangakoon, 13. Mrs. M. S. Sreshta, 14. Mr. L. H. S. Peiris, 15. Mr. W. G. Shorten, 16. Mr. W. Dias Bandaranayaka and 17. Mr. J. Vassilieff, with the Director of Agriculture as President, Mr. C. Drieberg, as Secretary, and the following Executive Committee: Sir S. D. Bandaranaika, Messrs. H. S. Stevens, J. P. Obeyesekere, J. A. Victor Perera, A. P. Goonatilleke, Claude Crozier, M. Shanks, and Rolf Smerdon.

Of these original members the following have left the Island, and their names do not, therefore, appear on the roll: Mr. H. S. Stevens, Mrs M. S. Sreshta, Mr. J. Vassilieff and Rev. W. G. Shorten.

In 1920, the services of Mr. J. A. Victor Perera, who was a keen apiculturist, were lost to the Society by his death.

In 1920, two more members were enrolled viz :—Messrs. William Gibson, H. J. Allsop; and in 1921, there was an addition of four more viz : Messrs. J. L. Kotalawala, Percy R. Webster, R. Neville Rolfe and C. A. G. Ferguson.

On the 29th January, 1919, His Excellency the Governor met the members of Committee and inspected the Association's hives at the Government Stock Garden, Peradeniya.

The most important work done by the Society was the investigation (by a Sub-Committee consisting of Mersrs. Rolf Smerdon, Claude Crozier, A. P. Goonatilleke, Charles Andree and C. Drieberg) of the requirements of the Ceylon honey bee *(Apis indica)*, and the recommendation of a hive which would best meet them.

The hive recommended by this Committee (to be adopted as a temporary standard) consists of ten frames each 11 in. × 5 in.

In 1919, the Secretary addressed a circular to the Chairmen of the various District School Committees with a view to securing funds for introducing bee-keeping into Government Vernacular Schools, with the following results.

In 1920, the following votes were secured :—Ratnapura Rs. 100, Kegalle Rs. 100, Matara Rs. 100, Hambantota Rs. 50, Kandy Rs. 100, Matale Rs. 30, Kurunegala Rs. 100, Puttalam Rs. 30, Chilaw Rs. 50, Anuradhapura Rs. 50, Trincomalie Rs. 10.

The votes for the current year are :—Matale Rs. 30, Batticaloa Rs. 50, Kandy Rs. 100, Ratnapura Rs. 50, Puttalam Rs. 50, Chilaw Rs. 90, Kurunegala, Rs. 100, Anuradhapura Rs. 50, Kalutara Rs. 25, Mullaitivu Rs. 29, Kegalle Rs. 50, Matara Rs. 80.

With this provision it has been possible to supply 132 hives (besides accessories) to the following schools :—

1920.

Ratnapura District.—Dippitigala, Balangoda, Godakawela, Rakwana, Kendangomuwa, Malwala, Imbulpe, Nivitigala, Dodampe, Opanaike.

Matara District.—Kamburugamuwa, Maliduwa, Paraduwa, Telijjawila, Marambe, Weligama, Mirissa, Narandeniya, Kotapola.

Kurunegala District.—Boyagane, Weuda, Wariyapola, Ibbagamuwa, Narammala, Kuliyapitiya, Madagalla, Dieullewa, Hettipola, Nikaweratiya.

Matale District.—Tenna, Madipola, Madawala ulpota.

Kandy District.—Udahentenne, Mediwaka, Haloluwa, Gunnepana, Talatuoya, Hedeniya, Teldeniya, Uduwa, Panwila, Deltota.

Anuradhapura District.—Kahatagasdigiliya, Eppawela, Ralapanawa, Mahadieulwewe.

Trincomalie District.—Toppur.

Puttalam District.—Talgaswewa, Wadatta, Anamaduwa.

Chilaw District.—Kelegama, Potuwatawana, Walahapitiya, Wekada, Nattandiya.

Hambantota District.—Tissamaharama, Mandaduwa, Ambalantota, Na, kulugama, Kirama.

Kegalle District.—Kehelwatta, Pinnawella, Kitulgala, Deraniyagala, Kottapola, Getiyamulla, Molagoda, Beddewela, and Mawatagoda.

The following schools have been supplied out of the votes of this year :—

Matale District.—Yatawatta, Kaikawela, Naula.

Batticaloa District.—Eraur, Addalachchenai, Nindoor, Irakkamam, Oluvil.

Kalutara District.—Uduwara, Tudugala.

Mullaitivi District.—Mamaduwa.

Kegalle District.—Ambepussa, Dorawaka, Uda-Hinguruwaka, Yakella, Wakirigala.

Kandy District.—Ankumbura, Paranagama, Marassana, Yatiganhulaha, Hanwella, Urugala, Wattappola, Menikdiwela, Kobbekaduwa, Ulapane.

Ratnapura District.—Udagama, Damahana, Illukkumbura, Ranwala, Ematiyagoda.

Matara District—Kamburugamuwa, Ketanwila, Dampella, Beralapanatara, Rotumba.

Puttalam District.—Walpaluwa, Tammannawetiya, Ihalapuliyankulam, Mahakumbukkadawala.

Chilaw District.—Maiyawa, Medagama, Pulichchchikulam, Kirimetiyana, Nattandiya Girls', Etiyawala, Galmuruwa, Udappu.

Kurunegala District.—Borawewa, Polpitigama, Atamuna, Poramadala, Bandarakoswatta, Kankaniyamulla, Ambanpola, Balalla, Awulegama, Wadakada.

Anuradhapura District.—Kendewe, Kebitigollewe, Topawewe, Horawapatana, Tammuttegama.

The hives and accessories are being made for the Association by one of its members, Mr. C. Crozier, whose practical experience qualifies him to act as its chief adviser, and whose willing and ready assistance to amateurs have been a valuable asset to the Association.

The accessories consist of the following articles :—Super, Entrance guard, Queen cage, Bee escape, Queen Excluder, Smoker. The Association also manufactures comb foundation for *A. indica* with the aid of a machine which was made in America.

Mr. A. P. Goonatilleke, an enthusiastic apiarist, published an illustrated work on bee-keeping in Sinhalese at his own expense, and generously supplied 1,000 copies free of cost for distribution among schools. These books have been eagerly sought after, and have been the means of giving teachers and others information which would not otherwise have been available to them.

The Association has published a leaflet embodying Practical Hints to beginners in bee-keeping, Rules of the Association, Report of the Standardization Sub-Committee, and a Catalogue of books and papers belonging to the Society and available for loan to members ; also Sinhalese and Tamil translations of the Hints to beginners in Bee-keeping. Arrangements are in train for publishing a handbook on Bee-keeping in English.

Hives and accessories have been supplied to the following private individuals (both members and non-members):—Mrs. Sreshta, Messrs. F. R. Dias, L. H. S. Peiris, C. Andree, H. S. Stevens, W. G. Shorten, U. B. Unambuwe, S. Molligoda, A. P. Goonatilleke, R. Smerdon, D. J. M. Seneviratna, S. W. Illangakoon, Y. E. Small, Piachaud, W. Dias Bandaranayaka, William Gibson, A. R. Panditasekere, Dr. E. Ludovici, Messrs. A. J. Stronach, C. Crozier, H. Sirimana, Alex. Sylva, L. Perera, H. J. Allsop, Donald Obeyesekere, P. M. Martinsingho, J. P. Obeyesekere, W. Balasuriya, H. G. Marthenis Appu, W. A. Gomes, A. E. Wells. L. de Z. Jayatilleke, D. A. D. Gunaratna, Mrs. H. Ludovici, Agricultural Instructor, Godakawela, S. O. Peiris, Sir S. D. Bandaranaika, Messrs. V. T. de Bond, D. B. Gunaratna, Percy Webster, R. Neville Rolfe, J. L. Kotalawala, M. J. A. Karunanayaka, H. E. Candy, R. C. Boustead. G. B. Ematiyagoda, Mrs. Alwis, Messrs. L. Barber, F. C. Loos and D. A. Edirisinghe.

Through schools, bee-keeping has spread to the villages. From information based on enquiries made, it would appear that there are not less than 500 working hives of the modern type. Many teachers and others have had box hives made on their own account, and in some cases as many as a dozen are kept by one individual.

The time has now arrived for making permanent provision for carrying on the work hitherto done by the Association. This is necessary for various reasons, but chiefly owing to the closing of the Government Stock Garden, which has so long been the home of the Association. I would, therefore, recommend that the Department of Agriculture take over the property of the Association and continue to develop the work so far done, both among schools and among private individuals, with a view to fostering and improving Bee-keeping as a home industry.

The work is well worth pushing, not only for the value of the produce of the hive, but owing to the important influence of bees in the fertilization of fruit-bearing crops. Bee-keeping provides a healthy recreation for the town-worker, a pleasant occupation for those who have retired from active life, and an interesting study for the young.

With the removal of the hives, etc., to their new home, it should be possible to arrange for the control of the work which the Ceylon Bee-keepers' Association has hitherto attended to, by an officer of the Department, who should have one or more trained inspectors under him.

I should wish to place on record the honorary services rendered by the Foreman of the Government Stock Garden, who has been of considerable help to me in attending to correspondence and keeping accounts, a statement of which is annexed.

C. DRIEBERG,

Secretary, Ceylon Bee-keepers' Association.

Government Stock Garden,

Peradeniya, September, 1921.

FINANCIAL STATEMENT OF THE CEYLON BEE-KEEPERS' ASSOCIATION FOR 1919—21.

Dr. **1919.** **Cr.**

	Rs.	Cts.		Rs.	Cts.
To Cash received from Ceylon Agricultural Society ...	27	87	By Cost of Appliances ...	66	91
,, Subscriptions	170	—	,, Purchase of Wax for Comb foundations	32	85
,, Sale of Appliances ...	45	57	,, Books, Stationery and Printing	21	17
			,, Rail Freight	10	33
			,, Postal Charges	5	97
			,, Petty Expenses	8	90
			,, Balance	97	31
	243	44		243	44

Dr. **1920.** **Cr.**

	Rs.	Cts.		Rs.	Cts
To Balance from 1919 ...	97	31	By Cost of Appliances ...	991	93
,, Subscriptions ..	160	—	,, Purchase of Wax for Comb foundation ...	10	—
,, Sale of Appliances ...	238	33	,, Books, Stationery and Printing	48	09
,, Votes from District School Committees	720	—	,, Cost of one Block ...	13	98
,, Contribution for Prizes ...	25	—	,, Rail Freight	22	38
,, Bank Interest	1	98	,, Postal Charges	20	48
			,, Salary of Attendant ...	12	—
			,, Subscription to Apis Club ...	3	61
			,, Petty expenses	27	51
			,, Balance	92	64
	1,242	62		1,242	62

Dr. **1921.** **Cr.**

	Rs.	Cts.		Rs.	Cts.
To Balance from 1920 ...	92	64	By Cost of Appliances ...	820	25
,, Subscriptions	170	—	,, Purchase of Wax ...	5	—
,, Sale of Appliances ...	218	70	,, Books, Stationery & Printing	21	15
,, Votes from District School Committees	704	—	,, Rail Freight	17	55
,, Contribution for Prizes ...	5	—	,, Postal Charges	31	88
			,, Salary of Attendant ...	8	—
			,, Value of Prizes	30	—
			,, Subscription to Apis Club ...	15	41
			,, Petty Expenses	9	44
			,, Advance for Current Expenditure	10	—
			,, Balance	221	66
	1,190	34		1,190	34

Peradeniya,
5th September, 1921.

C. DRIEBERG,
Hony. Secretary,
Ceylon Bee-keepers' Association.

MINUTES OF MEETING OF CEYLON BEE-KEEPERS' ASSOCIATION.

Minutes of a meeting of the Ceylon Bee-keepers' Association held at the Office of the Director of Agriculture at 9 a.m. on the 24th September, 1921:—

Present :—The Hon'ble Mr. F. A. Stockdale, Director of Agriculture, in the chair. Messrs. R. Smerdon, A. P. Goonatilleke, C. Drieberg, Secretary, and M. J. Fernando.

Read and confirmed minutes of previous meeting, held on the 22nd November, 1919.

Passed vote of condolence on the death of MR. J. A. V. PERERA.

Read letters of excuse from MR. GEORGE CROZIER explaining his absence and offering certain practical suggestions, and MR. J. P. OBEYESEKERE.

Adopted Secretary's report for 1919-1921, and statement of accounts brought up to 13th September, 1921.

The Secretary proposed that, owing to the closing down of the Government Stock Garden, the work of the Association be transferred to the Department of Agriculture. After considerable discussion, it was resolved that the Association continue as heretofore, with MR. DRIEBERG as Secretary, but that the votes made by the District School Committees for the supply of hives to schools be dealt with by the Agricultural Department.

Considered the question of membership and rate of subscription, and resolved that no alteration be made.

Resolved that the only defaulting member be pressed for his subscription due for the current year, and that his name be removed from the books of the Association.

Read letters from MR. GOONATILLEKE, MR. SMERDON and MR. CROZIER *re* provisional standard hive, and resolved that it be given a further trial, but that MR. CROZIER be asked to use his discretion in the selection of a more suitable timber for the hives.

Resolved that the Tamil leaflet on Hints to Bee-keepers be printed and that the MS of the English manual (on which MR. DRIEBERG and MR. GOONATILLEKE are engaged) be forwarded to the Director of Agriculture as soon as ready, to be printed as a Departmental Bulletin : also that reprints of articles dealing with apiculture in the TROPICAL AGRICULTURIST be circulated to members.

Exhibited specimen of a queen cage forwarded by MR. L. B. AMAKAKOON of Kegalle and decided to submit it to MR. A. P. GOONATILLEKE for a report which he kindly undertook to make.

Discussed the suitability of entrance guards now used and resolved to draw MR. CROZIER's attention to the fact that queens could be dragged through the opening.

Re bee disease, the Secretary undertook to make further observations and report to the Government Entomologist.

Considered question of encouraging apiculture in schools and resolved that it is desirable that bee-keeping be included as a subject for grant in the Government Code. The Director of Agriculture undertook to bring the matter to the attention of the Director of Education.

Resolved that an Instructor in bee-keeping be appointed at an early date, with a view to teaching bee-keeping at the School of Tropical Agriculture, and also visiting village schools and instructing teachers and others in modern bee-keeping methods.

Votes of thanks were accorded

(1) To MR. SMERDON for a gift of 5 hives to the Association

(2) and to MR. CROZIER for his valuable services, willingly given.

The meeting terminated with a vote of thanks to the HON'BLE MR. F. A. STOCKDALE for presiding.

C. DRIEBERG,
Secretary, C.B.K.A.

Government Stock Garden, Peradeniya.
26th September, 1921.

BEE-KEEPING IN PALESTINE.

(Abstract.)

Bee-keeping is not so extensively practised in Palestine as one would expect. The honey from native apiaries are not fit for export owing to the primitive method of gathering it, and is used only for the native market. Cylindrical clay pipes are used for hives : it does not sound artistic, but it is a fact that they are bound together with cow-dung, so that the whole gives the impression of a wall. Such walls contain sometimes 100 or 200 stocks.

There are, however, various colonies of German emigrants, as for example at Sarona, near Jaffa, where modern bee-keeping is carried on on a large scale and a first-class honey is gathered. In and around Sarona, where there are many orange groves, an average of 17 Kg. of very light-coloured, nearly white, honey is gathered, per stock. Some bee-keepers, after the orange-flow in April (which month is also the swarming season), move their stocks, loaded on camels, to the mountains, where about the same quantity is again secured from Sesame, and Olives and Thistles. This fine extracted table honey is for the most part exported to Egypt, for the use of the large number of visitors who resort there.

Palestine has, on the whole, a climate very suitable to bee-keeping, The temperature averages at Sarona are max. 100°F. minimum 37°F ; average 66°F. Decades may pass before it once happens that the thermometer drops to freezing point in the lowlying country, which explains why it is possible to keep bees in such primitive receptacles.

C. D.

A BAD BEE-KEEPING PRACTICE.

W. A. GOODACRE,

Senior Apiary Inspector.

A recent correspondent inquired whether, if he were to clip virgin queen bees for the purpose of forcing them to become drone layers for the production of drones for mating purposes, would such drones be good enough to mate with other queens ?

Let it be said at once that the suggested practice is a very undesirable one. In the first place, if there is a worker comb in the hive, the queen will select such comb to lay in, and the drones produced will be undersized ; and, if drone comb is used exclusively, the effect will be malnutrition, or undesirable drones of poor stamina. It is almost invariably noticed that, where there are a good number of drones raised as above, the percentage of improperly fertilised queens in the apiary is high. The stamina of the drone bee is, in my opinion, quite as important as that of the queen, and the best drones only should be produced, being raised naturally by the bees under stimulating normal conditions.

A good way to procure early drones is to stimulate by regular feeding a number of the best Italian stocks. The drones from undesirable colonies can be kept down by using for breeding purposes the best worker combs in the hives, and by the use (especially at the time when young queens are due for the mating flight) of drone traps.—Agricultural Gazette, N. S. W., Vol. XXXII, Part 6.

GENERAL.

PROVISIONAL SCHEDULE OF AGRICULTURAL SHOWS FOR THE SOUTHERN DIVISION.

The following is a provisional schedule of Agricultural Shows in the Southern Division, prepared by the Divisional Agricultural Officer and passed by the Food Production Committees of Galle, Matara, Hambantota and Kalutara Districts. The schedule is a four-year cycle one, based on the four Districts of the Division. One District for a year in the Division is provided for, and intervening years are provided with Korale or Pattu Shows in each of the Districts other than that one in which a District Show is planned :—

1921.—*District Show.*	Galle (at Galle Town)		1st, 2nd, 3rd August, 1921
Korale Show, Kalutara.	Rayigam Korale (Horana)		23rd July, 1921
	Pasdum Korale East (Agalawatta)		25th June, 1921
Pattu Show Matara.	Kandaboda Pattu (Hakmana)		13th & 14th August, 1921
	Wellaboda Pattu (Dondra)		6th August, 1921
	Gangaboda Pattu (Tihagoda)		30th July, 1921
Pattu Show, Hambantota.	East Giruwa Pattu (Ambalantota)		12th February, 1921
1922.—*District Show.*	Kalutara (at Kalutara Town)		
Pattu Shows.	Galle-Bentota Wallallawita Korale (Elpitiya)		
	do Hinidum Pattu (Hiniduma)		
	Matara-Weligam Korale (Weligama)		
	do Morawak Korale (Kotapola)		
	Hambantota-Magam Pattu (Hambantota)		
1923.—*District Show.*	Matara (at Matara Town)		
Pattu Shows.	Galle-Gangaboda Pattu (Baddegama)		
	Talpe Pattu (Talpe)		
	Kalutara-Totamunes (Panadura)		
	Hambantota-West Giruwa Pattu (Wiraketiya)		
1924.—*District Show.*	Hambantota (at Tangalla Town)		
Pattu Shows.	Galle-Wellaboda Pattu (Ambalangoda)		
	Gravets (Akmimana)		
	Matara-Gangaboda Pattu (Tihagoda)		
	Kalutara-Pasdum Korale West (Matugama)		

INTENSIVE CULTIVATION.

ALBERT H. BENSON, M.R.A.C.,
Director of Fruit Culture.

In a young country like Queensland, with its vast undeveloped areas, it may at first sight appear somewhat premature to advocate intensive cultivation, and yet when one considers the subject carefully it is very evident that one of the greatest mistakes our agronomists have made has been the tendency to acquire more land or to put a larger area under cultivation than they can possibly attend to.

This fault is not confined to one particular class, as there is a general tendency to grasp more land than the owners or lessees thereof can possibly utilise to the best advantage.

In no branch of agronomy is this more evident than in that of fruit culture, as many of the failures in this industry are directly attributable to the orchardist's attempting to handle a much larger area than he can manage, with the result that the yield of his fruit trees, vines, or other fruit-bearing plants is very much smaller than they would have been had they been given the care they required to produce a maximum return.

The importance of maintaining an orchard in a vigorous state of health and of maintaining the soil in a high state of fertility—in other words, the intensive cultivation of the orchard—has been pointed out by me in my writings on many previous occasions, as I have always maintained and still maintain that a small area properly looked after will frequently yield a greater net return than a much larger area that is more or less neglected.

During recent years there has been a very great increase in the number of small fruit holdings, both in the coastal districts of Southern and Central Queensland and also in the granite belt, a large proportion of the occupiers of such holdings being returned soldiers. These small holdings, if properly handled, are ample to support their owners in comfort, provided they are utilised to the best advantage ; that is to say, that they are made to yield a maximum return.

This can only be accomplished by keeping the soil in a state of perfect tilth and in a high state of fertility, and by keeping the trees, vines, or other fruits free from disease and in a state of vigorous growth. These conditions can only be maintained on comparatively small areas, as they demand the constant attention of the orchardist, which they would not get did he attempt to handle a bigger area than he is capable of dealing with thoroughly.

The profits to be obtained by intensive cultivation would astonish those who have not gone into the matter carefully, as when land is kept in a high state of fertility and cultivation and is utilised to the best advantage it returns many times the yield it would do were it treated in the casual manner that many of our farms, orchards, and gardens are. To prove this, one has only to see the returns a Chinese market gardener gets off a small area which he works systematically and utilises to the best advantage.

Intensive cultivation demands two things :—one, the thorough preparation of the land and its maintenance in a state of perfect tilth ; and the other, the maintenance of the fertility of the soil so that it contains an

adequate supply of all essential in plant foods in an available form. The former necessitates not only the working of the surface soil, but the deep stirring and pulverisation of the subsoil, so that the trees or fruit-producing plants grown thereon may be induced to root deeply, and thus be able to withstand dry spells much better than they would do were the majority of their roots near the surface.

The latter is not merely a matter of supplying the land with certain plant foods required as nutriment by the particular tree or plant, but, what is more important, the plant foods added to the soil must be available. No plant foods that are added to the soil in the form of commercial fertilisers can be made use of by any plant until they are dissolved in the water contained in the soil, as they can only enter the plant when in solution, and then only by means of the growing extremities of the finer roots.

It will thus be seen that, unless the soil retains an adequate supply of water, the application of artificial fertilisers will do little good, as the plant is unable to make use of them. The retention of the necessary water in the soil is dependent first on the maintenance of the soil in a state of perfect tilth, so as to prevent the loss of moisture by surface evaporation, and, second, by keeping up the supply of humus or organic matter in the soil ; as soils rich in humus have the power of absorbing and retaining more moisture than those that are deficient in this respect. Humus must be present in all soils in sufficient quantity, and when a deficiency occurs it must be made good either by the addition of farmyard manure or by the growing of suitable crops and ploughing them under—in other words, by green crop manuring.

Thorough cultivation and systematic manuring thus go hand in hand and are absolutely essential to the success of intensive cultivation.

Some years ago the Agricultural Chemist and the writer carried out a number of experiments for the purpose of determining the value of intensive cultivation as applied to the growing of bananas aad pine-apples, and the results of these experiments proved without a shadow of doubt that thoroughness in the culture of these two crops paid handsomely, and, further, that it was possible to so treat land that had been starved and neglected that it could be made to yield returns equal to those obtained from it in its virgin state.

Quite recently a further practical example of the results obtained by intensive cultivation has been brought under my notice, and, as the results are so satisfactory and show what good land properly treated is capable of producing, I purpose describing it for the benefit of our young growers, to many of whom it should be a valuable object lesson.

The example to which I refer is on the property of Mr. W. E. DEAN, Buderim Mountain, and consists of rather less than an acre of good volcanic soil that was originally scrub, and was first planted with bananas twenty-eight years ago. It remained under bananas for six years, when it was planted with paspalum and has since then been used as a grazing paddock, till broken up by MR. DEAN in 1919.

The paspalum when the land was broken up was saved, instead of being burnt, and was placed in the bottom of trenches 24 ft. apart, on the top of which banana suckers were subsequently planted 8 ft. apart in the row, or at the rate of 226 plants to an acre. Two hundred and nine suckers were planted in September, 1919. The land between the rows of bananas

was well and deeply worked, and midway between the rows a double row of pine-apples was planted, the lower side of the row being Ripleys and the upper smooths. The object of this method of planting the two varieties together was that the Ripleys, having a better hold of the ground, tend to keep the smooths from falling over. This principle is evidently a good one, as the plants of both varieties show a very healthy and vigorous growth; the colour is excellent, and they are bearing a heavy winter crop.

The soil is a deep volcanic loam from which the basalt stones and small boulders have been removed. It is in good heart, and, as previously stated, is kept in a thorough state of tilth.

During the spring of 1920 the land between the pine-apples and the bananas produced a heavy crop of cucumbers, for which a very satisfactory price was obtained, and the cucumber crop was followed by peanuts which have recently been harvested, so that it will be seen that none of the land has been allowed to remain idle.

With regard to bananas, selected suckers having large well-developed bulbs and a stem about 3 ft. 6 in. long were planted in September 1919, and these mother plants bore their first bunches during the end of 1920 and early part of 1921. From the mother plant only three followers have been allowed to grow, and these at different intervals, and so spaced that no one sucker interferes with another. All superfluous suckers were removed by means of a spud bar some 4 ft. long and sharpened to a chisel point some 2¾ in. wide at one end. Such a tool does the work neatly and does not injure the parent bulb to any serious extent.

Of the 209 stools, each of the two oldest followers is now carrying a bunch, so that on less than an acre of land there are over 400 bunches, which average over 20 dozen individual fruits each, and one bunch had no less than 27½ dozen.

The land is kept well worked right up to the pines and bananas, and there are no surface roots. The bananas are manured twice annually—the end of August and during February—when they receive either 2 lb. of dried blood, 1¼ lb. of superphosphate, and 1 lb. of muriate of potash per stool at each application, or 4 lb. of meatworks manure and 1 lb. of muriate of potash per stool. The manures are distributed around the stools and are well worked into the soil, and cost at the rate of £25 15*s.* 9*d.* per acre. When the returns are taken into consideration, this is a reasonable expenditure; further, once the initial expense of preparing the land and planting the crops has been met, the upkeep of the land has been light, as it is in such good order that its cultivation is a simple matter. Horse, not hand-culture, is employed, as there is no fear of damaging the roots.

The gross returns from this plot of land of less than an acre in extent will probably amount to over £400 in the year, provided the prices now being realised for bananas in the Southern markets are maintained, as the crop of fruit actually in sight is not far short of 300 cases, and, unless something at present unforeseen happens to destroy them, this quantity should be marketed. Mr. Dean's success is the result of good work well carried out, a striking example of the benefits to be derived from intensive cultivation, and a proof of my statement that a small area well worked will frequently yield a greater net return than a much larger area indifferently looked after. His success should also be an encouragement to many young growers who, instead of utilising their land to advantage, are frequently dissatisfied with the smallness of their holdings and think that they would do better if they had more land. In the majority of cases this is the greatest mistake they can make, as if they are not able to work a small area profitably they will have little chance of working a larger area to better advantage.—

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 30th SEPTEMBER, 1921.

Province, &c.	Disease.	No. of Cases up to date since Jan. 1st. 1921.	Fresh Cases	Recoveries.	Deaths.	Balance Ill.	No. Shot.
Western	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	83	—	83	—	—	—
	Anthrax	—	—	—	—	—	—
Colombo Municipality	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	91	3	—	—	—	—
	Anthrax	—	—	—	—	—	—
	Rabies	2	—	—	—	—	—
Cattle Quarantine Station	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	51*	—	—	—	—	...
	Anthrax	334†	9	—	—	—	...
Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	13	—	13	—	—	—
	Anthrax	—	—	—	—	—	—
	Piroplasmosis	13	1	7	5	1	—
Southern	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	35	—	35	—	—	—
	Anthrax	—	—	—	—	—	—
Northern	Rinderpest Foot-and-mouth disease Anthrax	Free					
Eastern	Rinderpest	—	—	—	—	—	—
	Foot-and mouth disease	241	—	204	9	28	—
	Anthrax	—	—	—	—	—	—
North-Western	Rinderpest	36	—	11	23	—	2
	Foot-and-mouth disease	—	—	—	—	—	—
	Anthrax	—	—	—	—	—	—
North-Central	Rinderpest Foot-and-mouth disease Anthrax	Free					
Uva	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	401	—	391	10	—	—
	Anthrax	—	—	—	—	—	—
	Hæmorrhagic Septicæmia	20	—	2	18	—	—
Sabaragamuwa	Rinderpest Foot-and-mouth disease Anthrax	Free					

* 7 cases occurred amongst sheep and goats. † occurred amongst sheep and goats.

G. W. STURGESS,
Government Veterinary Surgeon.

Colombo, 3rd October, 1921.

METEOROLOGICAL.

SEPTEMBER, 1921.

Station	Temperature: Mean Daily Shade	Temperature: Difference from Average	Mean Humidity	Mean amount of cloud 0=clear. 10=overcast	Mean Wind Direction during month	Daily Mean Velocity.	Rainfall: Amount	Rainfall: No. of Rainy days	Rainfall: Difference from Average
	°	°	%			Miles.	Inches		Inches
Colombo Observatory	82·4	+ 1·4	75	7·6	WSW	169	0·94	7	- 4·35
Puttalam	82·6	+ 0·8	75	4·4	SW	298	0·08	2	- 0·95
Mannar	84·5	+ 1·3	71	7·5	SW	187	0·49	4	- 0·58
Jaffna	83·6	+ 1·1	78	6·4	SW	338	1·91	4	- 1·00
Trincomalee	84·8	+ 0·4	67	7·0	SW	234	3·10	6	- 1·55
Batticaloa	84·3	+ 0·8	69	5·4	Variable	144	0·27	3	- 2·49
Hambantota	82·4	+ 1·4	75	5·2	SW	404	1·01	5	- 1·28
Galle	80·4	+ 0·4	82	5·7	WNW	342	4·67	10	- 2·85
Ratnapura	80·6	+ 0·6	81	6·8	—	—	6·25	24	- 8·71
Anu'pura	82·1	- 1·3	73	6·0	—	—	2·56	8	- 0·37
Kurunegala	81·4	+ 0·5	76	7·2	—	—	3·76	11	- 1·26
Kandy	76·6	+ 0·8	78	6·8	—	—	1·88	15	- 4·06
Badulla	74·2	- 0·9	75	6·6	—	—	3·10	11	- 0·30
Diyatalawa	69·5	+ 0·1	70	5·3	—	—	2·47	8	- 1·31
Hakgala	62·0	+ 0·4	82	6·9	—	—	2·08	15	- 4·13
N. Eliya	60·8	+ 1·4	84	8·6	—	—	2·49	21	- 5·77

The rainfall totals for the month were below average throughout the greater part of the island.

Deficits of over 10 in. were common north of Ratnapura, in the upper part of the Kelani Valley, and round Ambegamuwa and Watawala. Deficits of 2 in. or over occurred throughout the south-west of the island in an area which may be roughly defined by drawing lines eastward from Chilaw and northward from Tangalle.

A group of stations in the southern half of the North-Central Province were consistently above their average thanks chiefly to rain on the 8th-11th, and at the very end of the month. Northward of them, and in the Eastern Province, a slight deficit was general. In Uva the majority of stations were within 2 in. of their average but the offsets were in both directions.

As has been the case in several months this year the deficit showed more in the quantity of rain than in the number of rainy days. Similarly the amount of cloudiness was quite up to the September average.

The barometric pressure was on the whole high. Up to the 7th, and from the 12th to the 23rd its distribution was of a "South West monsoon" type, though accompanied by but little rain. From the 7th to the 11th it was of the "thunderstorm" type and during these days several cases were recorded of over 2 in. of rain in 24 hours. From the 23rd onwards both types were somewhat in evidence and (particularly on the 27th) produced a belated attempt to bring the rainfall up to its average.

On other points the table above explains itself. Temperature is naturally high and humidity low. Wind velocities slightly high.

A. J. BAMFORD,
Supdt. Observatory.